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## ENGINEERING DATA TRANSMITTAL

Page 1 of 1  
1. EDT 605893

2. To: (Receiving Organization) W. S. Josephson Solid Waste Storage	3. From: (Originating Organization) T. L. Erickson Solid Waste Projects	4. Related EDT No.: 605892
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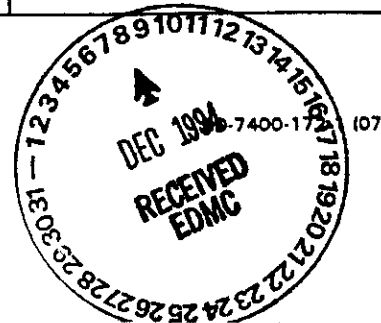
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1	1	Cog. Eng. JC Sabin	<i>J.C. Sabin</i>	8/19/94	H5-71	DB Powell			T4-03	3	
1	1	Cog. Mgr. TL Erickson	<i>TL Erickson</i>	8/23/94	H5-33	KM McDonald			T4-03	3	
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		Safety				JW Pratt			T4-04	3	
		Env.				GC Lengas			E6-42	1	
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# 224-T TRUSAF Building Upgrade

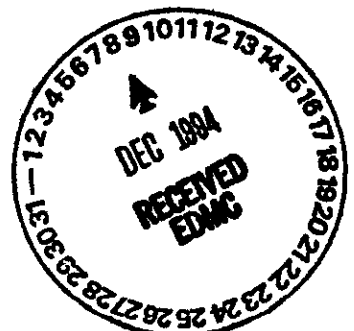
Prepared for the U.S. Department of Energy  
Office of Environmental Restoration and  
Waste Management



**Westinghouse**  
**Hanford Company** Richland, Washington

Hanford Operations and Engineering Contractor for the  
U.S. Department of Energy under Contract DE AC06-87RL10930

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## RELEASE AUTHORIZATION

Document Number: WHC-SD-WM-ES-0288, REV. 0

Document Title: 224-T TRUSAF Building Upgrade

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This document was reviewed following the  
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WHC Information Release Administration Specialist:

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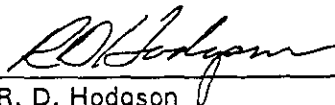
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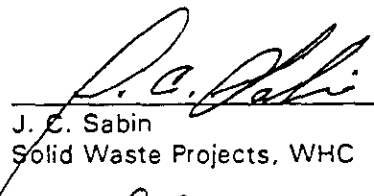
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<b>APPROVED FOR PUBLIC RELEASE 9/14/94 N. Sabin</b>		Signature <i>[Signature]</i>
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7. Abstract This study considers the upgrades that would be necessary to extend the life of the Transuranic Waste Storage and Assay Facility (TRUSAF) for an additional 30 years. The study also considers cleanup and conversion of the canyon area of the building for storage of solid waste. The 224-T Building was constructed in the 1940s to support process operations of the T-Plant. The function of the facility has changed over the years, and at present the northern half of the building is used to store solid waste. This portion of the building is referred to as the TRUSAF. TRUSAF is one of only two onsite facilities licensed to receive and store solid TRU wastes. Original intentions were for TRUSAF to be used for TRU solid waste storage until the WRAP 1 Facility became operational.		
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## 244-T TRUSAF BUILDING UPGRADE

Prepared by:   
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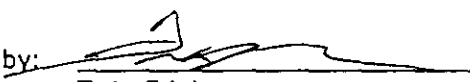
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Date 8/22/94

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## 244-T TRUSAF BUILDING UPGRADE

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## EXECUTIVE SUMMARY

The 224-T Building was constructed in the 1940s to support process operations of the T-Plant. The function of the facility has changed over the years, and at present the northern half of the building is used to store solid wastes. This portion of the 224-T Building is referred to as the 224-T Transuranic Waste Storage and Assay Facility (TRUSAF). Besides the Central Waste Complex, this is the only facility at the Hanford Site presently licensed, under the Resource Conservation and Recovery Act regulations, to receive and store solid TRU wastes.

It was originally planned that storage of this waste in the TRUSAF would be temporary pending the construction and licensing of permanent disposal facilities elsewhere. With the delays presently anticipated in the startup of the permanent storage facilities (WIPP), it is prudent to view the TRUSAF as a long-term storage facility. This study considers the upgrades to the TRUSAF that would be necessary to meet these long-term objectives.

If the TRUSAF is to continue to be utilized in its current size and capacity, this report recommends the following upgrades:

- Roof and exterior walls
- Loading dock
- Air lock
- Electrical
- HVAC
- Elevator
- Auxiliary drum lift
- Security
- Communications

These upgrades could be carried out over a 3-year period at an estimated cost \$4.4 million, which would be funded by the site maintenance budget.

The Part B permit under which the TRUSAF is operating, limits storage of waste to only the northwest half of the building (gallery section). Furthermore, the permit specifically prohibits any storage in the southeast half of the building (the cell area).

If additional storage space is required to store TRU/TRU mixed waste at TRUSAF, this report recommends that the following major building upgrades be considered.

- Decontaminate the cells under the Hanford Site D&D program. This will be accomplished over a 3-year period at a cost of \$9.9 million.
- Perform upgrades to the cell portion of the facility that will qualify this section of the building to operate as a storage facility for solid TRU waste under an interim status permit. It is estimated that the required upgrades will cost \$10.5 million and be completed by the year 1998. This portion of the project will be executed as a 1997 Line Item.

The D&D of the cell area will have to be performed in any event. The benefit, however, of converting the cell area to a storage area at an additional cost of \$10.5 million must be weighed against the option of constructing, permitting, and operating a totally new storage facility of the Butler-type building design.

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## ABBREVIATIONS

ACGIH	American Conference of Government Industrial Hygienists
ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
CAM	continuous air monitor
CP	Cutie Pie (Eberline Model RO-3 radiation measurement instrument)
CPS	Criticality Prevention Specification
CWC	Central Waste Complex
CY	calendar year
D&D	decontamination and decommissioning
DW	dangerous waste
EPA	Environmental Protection Agency
ER	Environmental Restoration
HEPA	high-efficiency particulate air
HLAN	Hanford local area network
HW	hazardous waste
HVAC	heating, ventilating, and air conditioning
ICF KH	ICF Kaiser Hanford Company
JSA	job safety analysis
NEPA	National Environmental Policy Act
NESHAP	National Emission Standards for Hazardous Air Pollutants
RCRA	Resource Conservation and Recovery Act of 1976
RH	remote handled
RHO	Rockwell Hanford Operations
RTR	real-time radiography
TLD	thermoluminescent dosimeter
TPA	Tri-Party Agreement
TRU	transuranic
TRUPACT II	WIPP shipping container
TRUSAF	Transuranic Waste Storage and Assay Facility
UPS	uninterruptible power supply
WAC	Washington Administrative Code
WHC	Westinghouse Hanford Company
WIPP	Waste Isolation Pilot Plant
WRAP	Waste Receiving and Processing

## I. INTRODUCTION

The 224-T Building was constructed in 1944 to support the operations of the 221-T Building. It provided the facilities for further concentration and decontamination of the plutonium products that were separated from the reactor fuel in the 221-T Plant.

The 224-T Building is divided into two sections by a 1-ft thick seismically qualified concrete wall, which bisects the building along its length in an southwest to northeast direction. (See Sketch 224-T-CS-001. All sketches are located in Appendix A.) The northwest section of the building is structured as an operating gallery and is divided into three floors. This operating gallery is presently operating under interim status as a storage area for solid waste and is referred to as the TRUSAF. This section also houses the offices and utility rooms for the 224-T Building.

The southeast section consists of six cells and an open, canyon-type space above the cells. The cells presently contain contaminated process equipment, tanks, and piping.

In the early 1970's, the operating gallery portion of the 224-T Building was upgraded by replacing the concrete block exterior walls with reinforced concrete walls and removing some nonstructural interior walls. These modifications, along with other reinforcements, made the facility seismically qualified and tornado hardened (RHO 1985).

In addition to the structural upgrades, the cell access doors and viewing windows between the operating gallery and the hot cells were removed and filled with concrete. Minor upgrades were also performed on the electrical and service utilities and the HVAC system. The HVAC upgrades included isolation of the 224-T TRUSAF exhaust system from the 221-T Building, sealing of the interconnecting pipe tunnel, replacement of a significant portion of the asbestos cement ducting with new metal ducting, and the installation of HEPA filters and turbine fans (see Sketches 224-T-MS-001 and 224-T-MS-003).

These modifications qualified the facility for storage of weapons-grade plutonium, a function which the facility performed from the early 1970's until 1989.

Since 1987, the 224-T TRUSAF has been permitted to store TRU, TRU-mixed and low-level mixed wastes. All the waste is in solid form and is contained in 55-gal drums. A definition of the waste types appears in Appendix B.

It was initially planned that the 224-T TRUSAF operate as a solid waste storage facility until the WRAP became operational in 1998. The 224-T TRUSAF would then be used as a temporary storage facility for waste enroute to a permanent disposal site.

Uncertainties that surround the future availability of permanent disposal facilities necessitate that the 224-T TRUSAF be viewed as a long-term storage facility. The current performance assessment and testing program at the WIPP is expected to continue for several years. It now appears unlikely that the WIPP will be able to accept TRU waste for disposal as scheduled in 1998. The 224-T TRUSAF, in addition to being licensed to accept low-level waste, is the primary facility at the Hanford Site licensed to accept and store TRU and TRU mixed waste. Extending the operational life of the 224-T TRUSAF, therefore, becomes a very viable option. Assuming that the requirement to maintain the 224-T TRUSAF as an operational storage facility is extended by 30 years, certain repairs and system upgrades are required to allow it to operate safely and reliably throughout its extended life. Phase I is the scope of work required to repair and upgrade the section of the building presently being used for waste storage.

If it is decided that the cell area be converted to storage, the upgrades to 224-T would be carried out in the following phases:

- Phase I, Facility Upgrades (to gallery section of building)
- Phase II, Decontamination of Hot Cell Area
- Phase III, Conversion of Hot Cell Area to Storage Area

This approach will not jeopardize the present interim status permit of the 224-T TRUSAF.

## II. FACILITY MODIFICATIONS

### A. PHASE I - FACILITY UPGRADES

#### 1.0 Roof and Exterior Walls.

This is a flat built-up roof of hot tar and gravel (see Sketch 224-T-C-001, Appendix A). The existing roof and walls are leaking and the overall condition of the roof is not known. For estimating purposes it is assumed that a new roof, consisting of light weight steel trusses, covered with metal roofing and supported by wall buttresses, will be constructed over the existing roof (see Appendix D).

When the facility was upgraded for seismic qualification, the concrete filler blocks between the cast in place concrete columns and beams were removed and the space filled with reinforced concrete. The concrete has shrunk and, during heavy rainfall, water can now penetrate through the joints between the concrete and the columns. It is proposed to seal the joints with caulking material.

#### 2.0 Loading Dock.

A 45-in-high concrete loading dock will be constructed at the point of the existing double-wide door at the south end of the 224-T TRUSAF. The loading dock will be equipped with truck bumpers and truck bed elevation adjustments. It will have a metal roof and side weather protection. A down ramp or hydraulically controlled drum lifter will transfer the drums to the ground level for further transfer to the 224-T TRUSAF.

#### 3.0 Air Lock.

In order to maintain the storage section of the building at negative pressure during drum transfer, entry will be through an air lock. For estimating purposes, this is assumed to measure 15 ft long by 8 ft wide by 10 ft high. This will accommodate the drum supporter (forklift).

#### 4.0 Electrical Systems.

The main upgrades will consist of the following:

- Install a new main switchgear assembly.
- Install two new 500 kVA power transformers, each supplied from a different power source. The switchgear will be connected to both transformers with one tie breaker being open at all times.
- Install a new motor control center.
- Install new lighting panelboards.
- Install an UPS system for critical loads.
- Remove, or abandon in place all existing wiring and install new wiring in conduit.
- Install new services to the elevator and the HVAC system.

The proposed new electrical system is shown in Sketches 224-T-ES-001 and 224-T-ES-002 (Appendix A).

#### 5.0 Heating, Ventilating, and Air-Conditioning System.

At present, the building is being heated by steam. It is proposed that this system be disconnected and a new heat pump type of heating system be installed. The new heating system will only serve the office, assay, and x-ray areas. The space heating of the gallery section also provides freeze protection for the fire sprinkler system. Modification to the heating system would, therefore, require that the existing wet sprinkler system be converted to a dry system. This upgrade could be postponed until the existing 200 Area steam plants are removed from service.

The existing asbestos ductwork on the first floor will be replaced with metal ductwork (see Sketch 224-T-MS-002, Appendix A).

The existing pre-heat system coils will be replaced.

New test ports will be installed in the exhaust system and the atmospheric pressure reference sensor will be replaced.

## **6.0 Elevator System.**

The elevator is essential for drum and fork lift transfers between floors in the storage facility. The existing transfer elevator is 50-years old and does not comply with current State inspection codes. As a minimum, it is expected that the hoisting, electrical, controls and safety equipment of the elevator will need to be replaced if the facility is to continue operations for the next 30 years.

The elevator car size is small and limits the number of drums that can be transferred at one time. The existing concrete shaft for the elevator necessitates that the car size remain the same; this limited size will continue to be an operational problem during drum transfer.

## **7.0 Auxiliary Drum Lift.**

Failure of the elevator system will disable the transfer of drums to the second and third floors. As a back up to the elevator system, it is proposed to install a vertical reciprocating conveyor (drum lift) on the west or north exterior side of the facility. The drum lift will have a carrying capacity of 4,000 lb and will be limited to freight transfer only. It will have a vertical lift of 24 ft on an 8- by 10-ft platform. In order to minimize disruption to on going operations, it is proposed that the lift mechanism and the weather tight enclosure be installed first without any openings being made in the walls of the building. On completion of this exterior work, three access doors will be cut through the concrete wall using a high-pressure water lance.

## **8.0 Security System.**

Many of the present exterior doors are wooden. It is proposed that all of the wooden exterior doors be replaced with adequate fire and security metal doors equipped with door alarms. Since the facility is unmanned, the door security system will include entry control (finger print or card access). The alarm system will be connected (through the site HLAN system) to a remote annunciation point (TBD).

## 9.0 Communication System.

HLAN service will be installed at the facility to provide connection to the sitewide communication channel for transmission of waste inventory monitoring and control information.

The facility upgrades are discussed in more detail in Appendix D. The estimated cost for these upgrades is \$4,400,000 (see Appendix G). It is proposed that these upgrades be carried out in stages over a 3-year period under the site maintenance program and will be funded out of the maintenance budget. The schedule for this phase of the project is shown in Appendix J.

Since the upgrades will merely consist of replacing existing worn out systems without changing the basic character of the building, the qualification of the facility to operate under the present interim status permit will not be affected.

## B. PHASE II--DECONTAMINATION OF HOT CELL AREA

Decontaminating the cells will provide approximately 15,000 ft<sup>2</sup> of the Hot Cell area for reuse. Prior to performing any structural and facility changes to the cell area, the cells must be decontaminated. Radiological characterization of the 224-B Facility (RHO 1985) indicates that essentially all of the contamination is contained in the cells. Since the function of the 224-T cell area has essentially been the same as that of the 224-B Building it can be assumed that the radiation profile within the cells will be approximately the same. This amounts to about 31 Ci of plutonium, 5.2 Ci of americium, and 26 Ci of fission/activation products. Because of the low-radionuclide inventory, especially in fission/activation products, radiation exposure will not be a problem during decontamination activities. At a later stage of the project, the actual radiation profile of the 224-T cells will be verified.

The project scope includes:

- Isolate the building from potential radioactive contamination sources
- Remove a portion of the vessel ventilation tunnel
- Remove and dispose all equipment presently in the cells
- Decontaminate the building
- Remove fume hood in receiving area

Actual cleanup of the facility could begin in FY95. During the first quarter the following activities could be performed:

- Prepare the building for equipment removal and decontamination.
- Isolate the utilities serving the cells from the utilities for the rest of the building and provide new, temporary utilities to the cells during the decontamination process.
- Inspect, test, and upgrade cell equipment such as the canyon crane.

Following building preparation, D&D will commence with cells A through E. This will include stripping the equipment and piping. As waste is removed, it will be assayed for TRU content and packaged for disposal as low-level waste or for storage as TRU waste.

Following equipment and piping removal, decontamination of the building surfaces in A through E cells will begin, which includes:

- Surfaces will be cleaned or removed leaving only fixed contamination with very low dose rates.
- The cell ventilation system will be disconnected from A through E cells after the cells are decontaminated and reconnected to F cell. The same sequence will be followed in F cell.

After the building is decontaminated the following safety precautions will be taken to put the building on standby status:

- Excavate and remove the air tunnel that lies parallel to the cells.
- Cut the concrete tunnel and clay drain pipe into sections and dispose of all debris in a low-level waste burial ground.
- Close the openings created in the walls and floors by removing the ducting, piping and equipment, and the inner cell walls.
- Return existing utilities to normal service. All utilities will be upgraded as part of the conversion of the cell area to storage area.

A detailed description of the D&D activities is given in Appendix E.

There is a discreet separation between this portion of the building and the portion currently being used for drum storage. D&D work, therefore, will not interfere with operations in the storage areas nor will it have any impact on its qualification for its present interim status permit.

It is estimated that the cost of the D&D effort will be \$9.9 million (see Appendix H). This work will be performed under the site D&D program and will be funded by D&D funds. It is also estimated that the duration of the D&D effort will be 3 years as shown in the schedule (see Appendix J).

Activities planned for FY95 include preparing the project plan, the environmental documentation and a safety analysis report. Project closeout will include preparing a closeout report and engineering orders to modify the 224-T Building drawings to reflect the final facility configuration.

#### **C. PHASE III--CONVERSION OF HOT CELL AREA TO STORAGE AREA**

This phase of the project will construct the systems necessary to allow the facility to be licensed and used as a storage facility for TRU waste.

The proposed construction covers the following items:

- Remove and fill in the exterior cell area access doors. Two of the existing access doors will be left and will be modified accordingly to allow waste transfers to be carried out safely and efficiently. The entries will include air locks.
- Construct a loading dock at each of the access doors.
- Install new electrical power and fire detection/suppression systems.
- Reconnect the exhaust system of the cell area to the existing exhaust system of the gallery side.
- Install an automated stacker/retriever to facility storage, inspection and computerized inventory control of the waste drums.
- Install necessary radiation and air monitoring systems.

A detailed description of the scope and activities of the conversion of the cells to a storage area are given in Appendix F. The 224-T TRUSAF integrated program schedule is provided in Appendix J.

The project will be executed as a stand alone, Line Item project. It is estimated that the cost of these modifications will be \$10.5 million. The cost estimate for this phase is given in Appendix I.

Licensing this portion of the building to operate as a storage of TRU waste will be pursued independently of the licensing of the portion of the building presently operating as a storage facility.

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<sup>1</sup>New Document # is SD-HS-SAR-025

<sup>2</sup>New Document # is SD-WM-SAR-038

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<sup>4</sup>New Document No. is Memo No. 9056223D

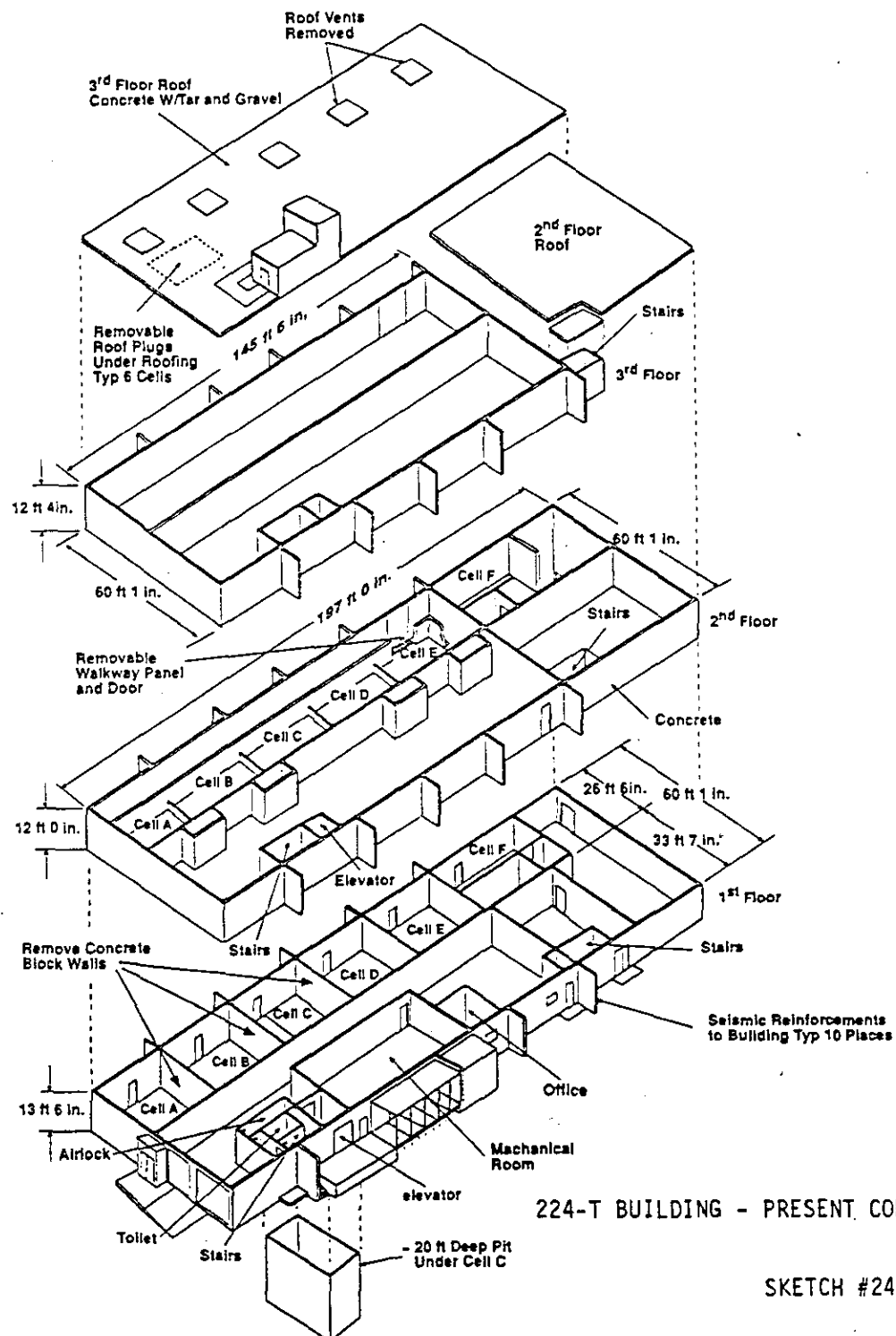
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## APPENDIX A

### Sketches

224-T-CS-001, 224-T BUILDING PRESENT CONFIGURATION .....	A-1
224-T-CS-002, 224-T BUILDING REVISED CELL BLOCK AREA .....	A-2
224-T-CS-003, D&D STAGING BUILDING .....	A-3
224-T-MS-001, AIRFLOW DIAGRAM .....	A-4
224-T-MS-002, ASBESTOS DUCTWORK TO BE REPLACED .....	A-5
224-T-MS-003, F-CELL HEPA FILTER SYSTEM .....	A-6
224-T-ES-001, ELECTRICAL ONE LINE DIAGRAM .....	A-7
224-T-ES-002, ELECTRICAL PANELBOARD SCHEDULE .....	A-8

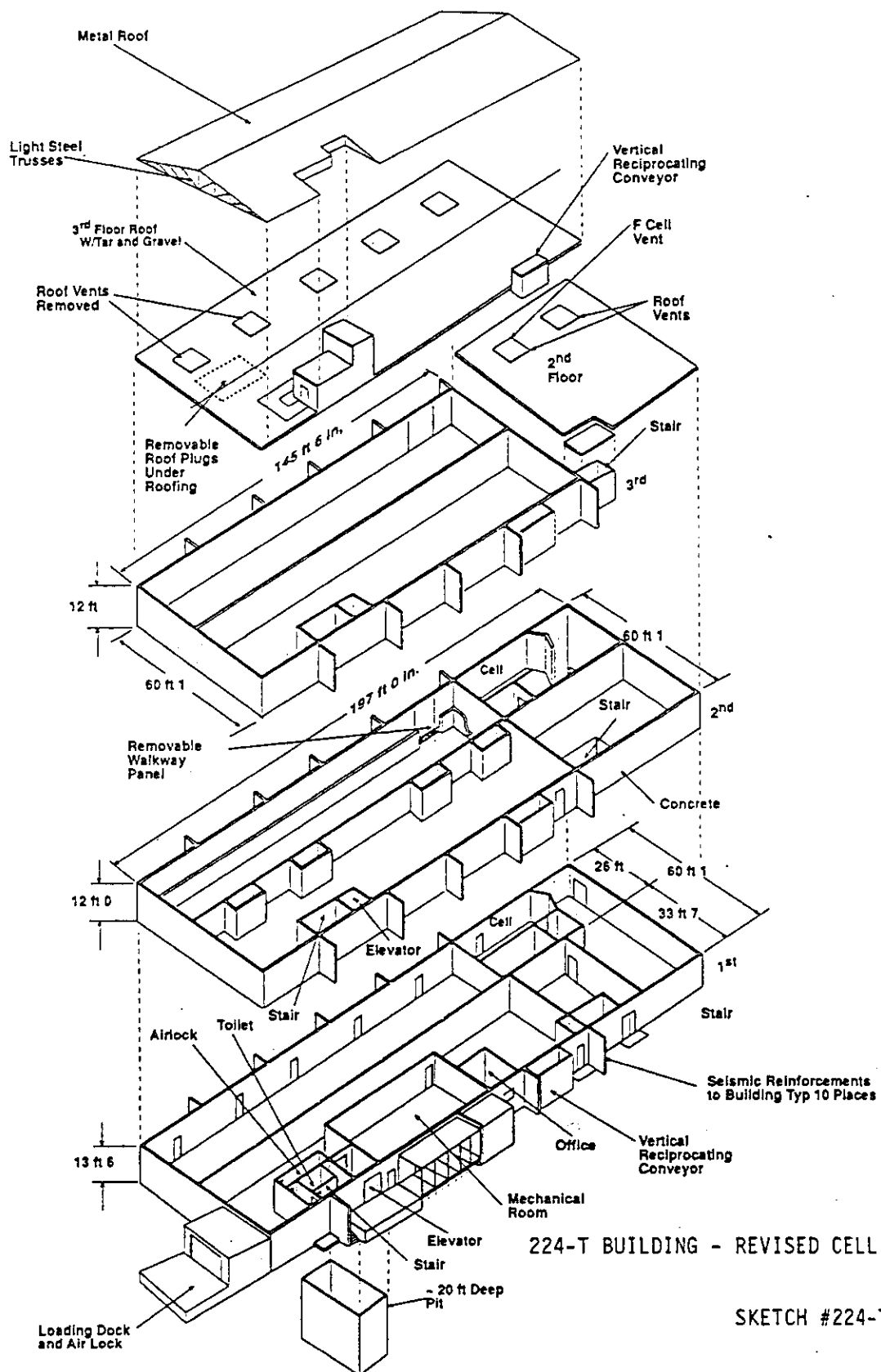
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224-T BUILDING - PRESENT CONFIGURATION

SKETCH #244-T-CS-001

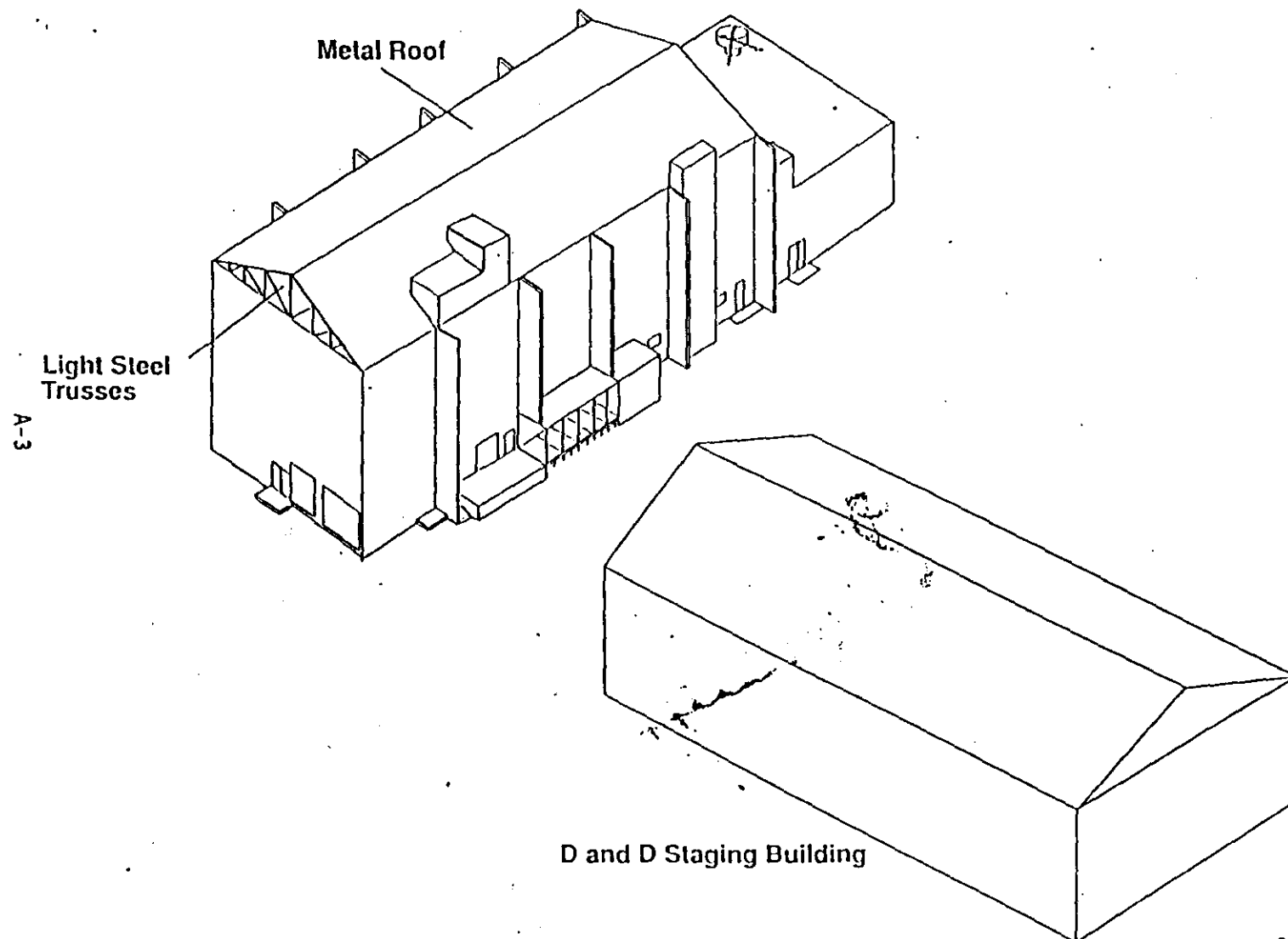
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224-T BUILDING - REVISED CELL BLOCK AREA

SKETCH #224-T-CS-002

39402042.2



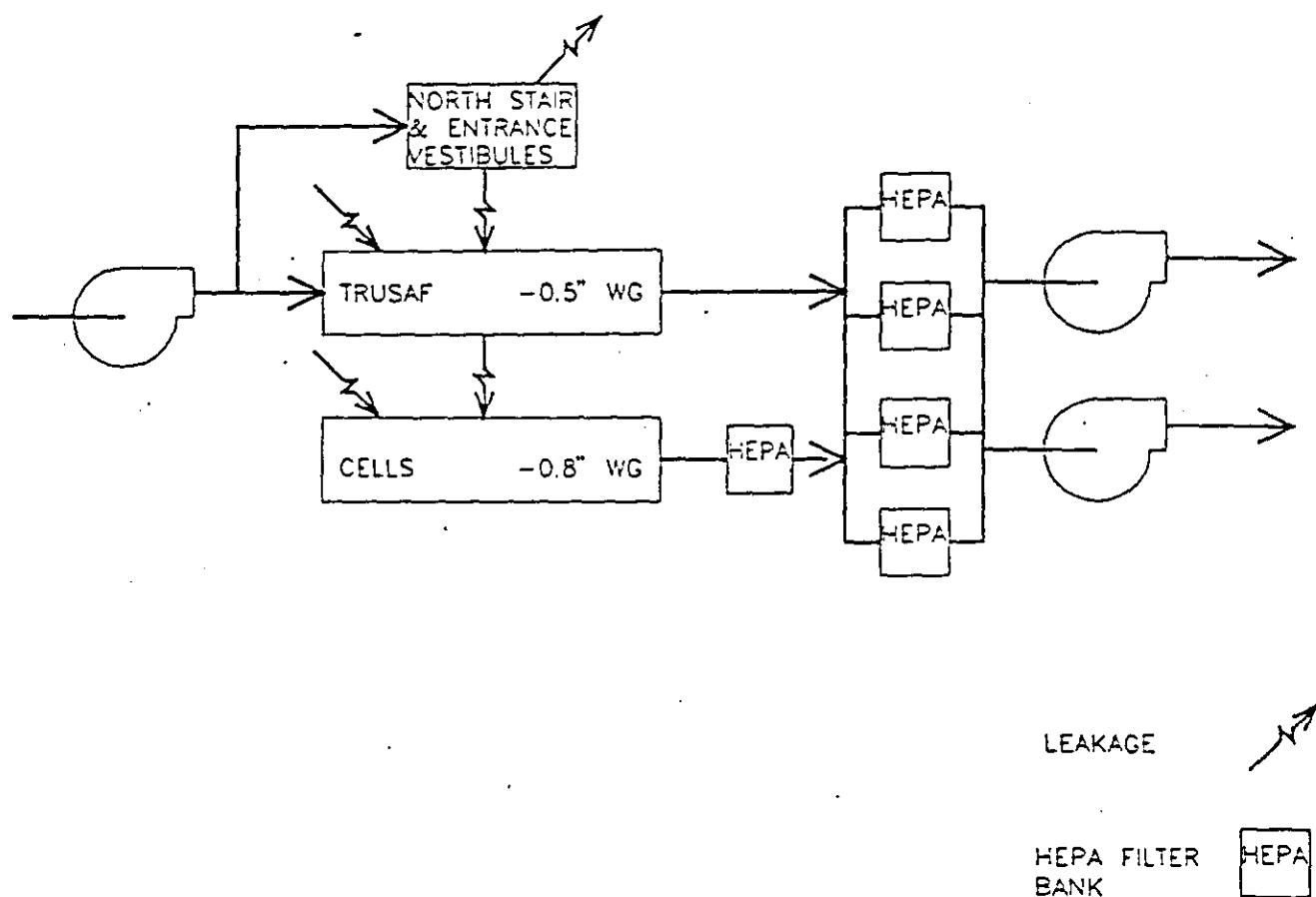


FIGURE #2, AIRFLOW DIAGRAM

A-5

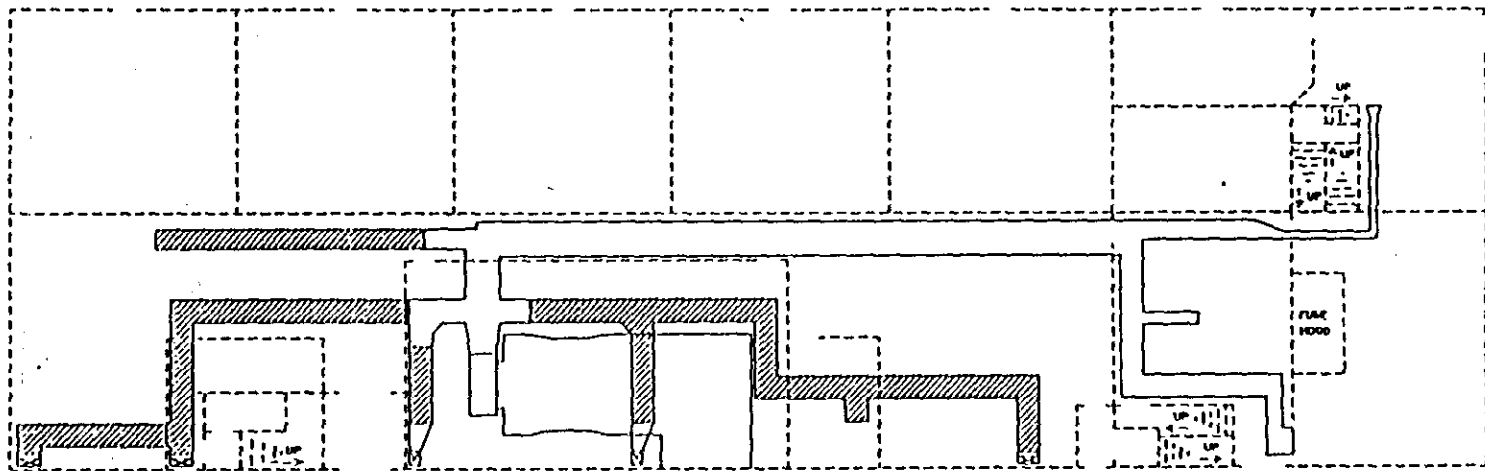
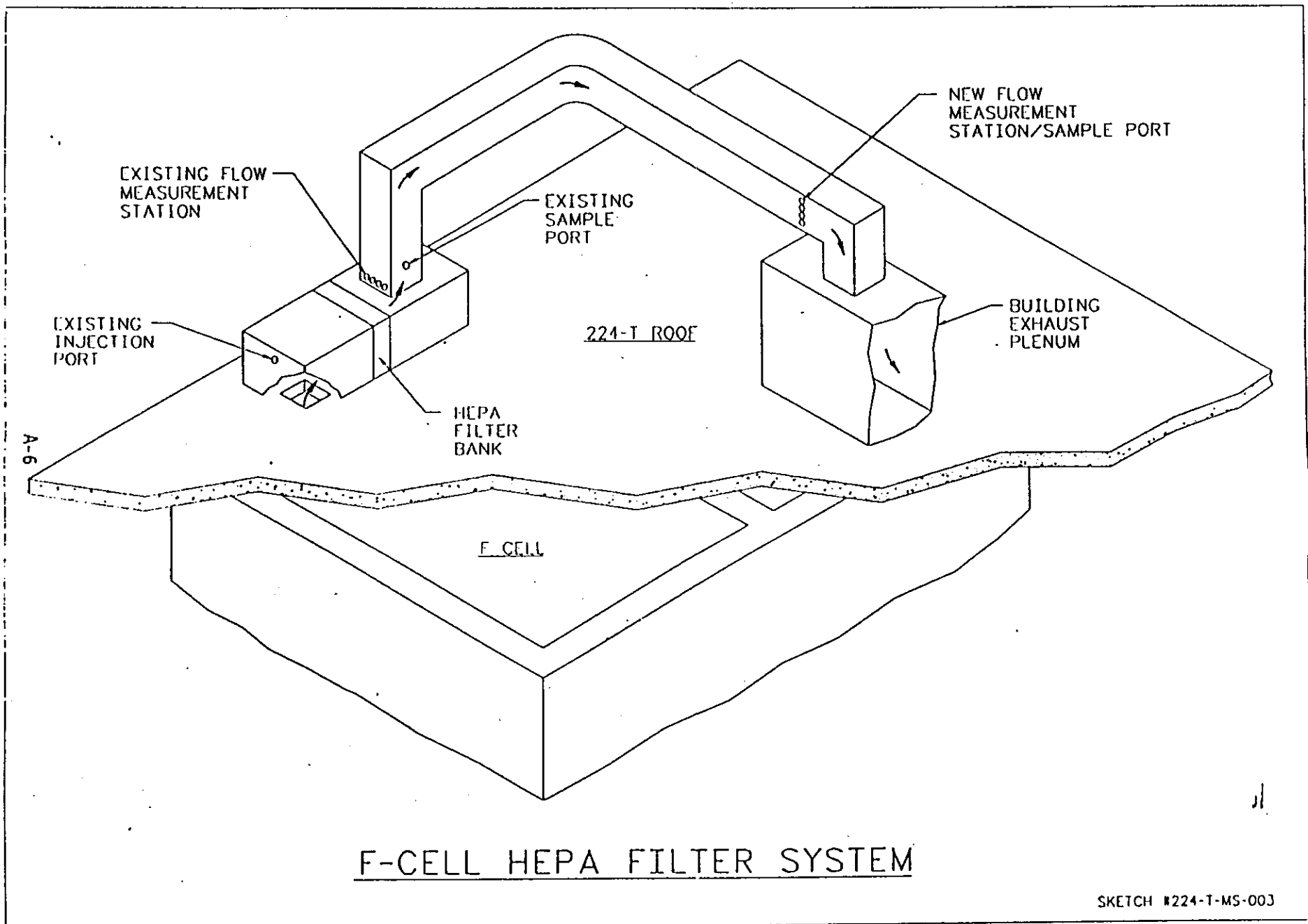
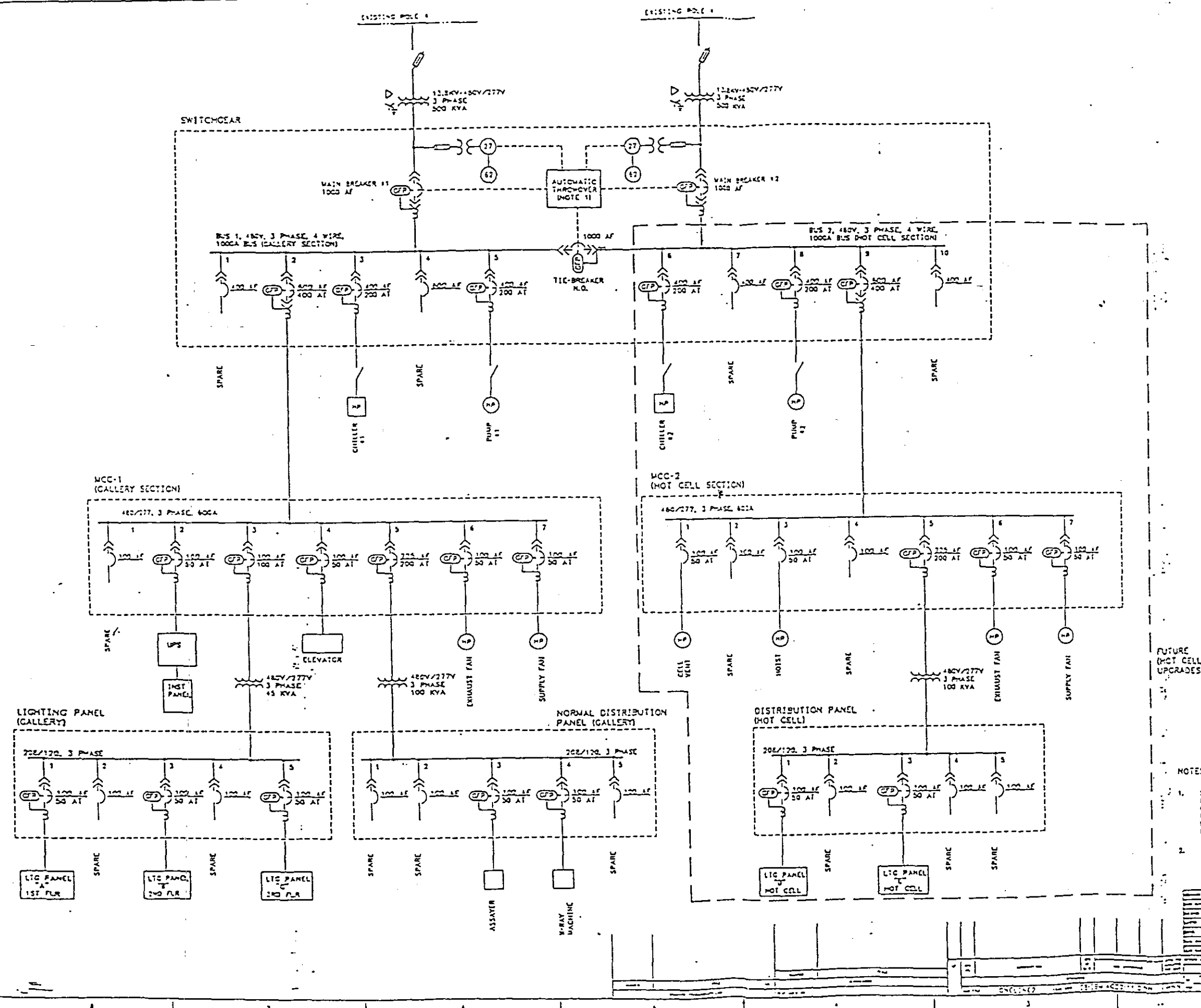
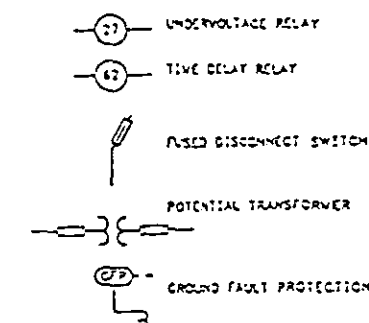


FIGURE #3, ASBESTOS DUCTWORK TO BE REPLACED

NO SCALE



## LEGEND

FUTURE  
(HOT CELL  
UPGRADES)

## NOTES:

1. SWITCHGEAR SHALL OPERATE WITH TIE-BREAKER NORMALLY OPEN AND BOTH MAIN BREAKERS NORMALLY CLOSED. FAILURE OF EITHER TRANSFORMER WILL TRANSFER LOAD TO OTHER BUS. ALSO ON LOSS OF VOLTAGE, THE LOAD WILL TRANSFER AUTOMATICALLY TO THE OTHER BUS EXCEPT WHEN FAULT IS DETECTED ON THE FEEDER.
2. ALL BREAKERS ARE 3 PHASE UNLESS NOTED OTHERWISE.

PRELIMINARY	
U.S. DEPARTMENT OF ENERGY	
HIGH-LEVEL OPERATIONS OFFICE	
BY EASTER RANTFORD COMPANY	
ELECTRICAL	
ONE LINE DIAGRAM	
TAS-47 BUILDING MODIFICATION	
224-T-ES-001	10

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FUTURE

2. Plot Scale: 1:1

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## APPENDIX B

### Waste Classifications and Waste Packaging Requirements

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## WASTE CLASSIFICATION AND PACKAGING REQUIREMENTS

### I. GENERAL

TRU wastes that are also mixed waste are subject to the requirements of the Atomic Energy Act and the Resource Conservation and Recovery Act. Buried TRU wastes are subject to the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act and the Superfund Amendments and Reauthorization Act.

The 224-T TRUSAF, classified as a container storage facility for TRU mixed and low-level mixed waste, has been permitted under Ecology, Dangerous Waste Regulations, WAC 173-303-806 for receiving and storing mixed wastes. The primary mission of the 224-T TRUSAF is to receive and store certified TRU mixed waste.

### II. WASTE TYPES

#### 1.1 TRU WASTE

TRU radionuclides are those radionuclides with an atomic number greater than 92 (uranium). TRU waste is defined by DOE Order 5820.2A as any waste, regardless of source or form, that is contaminated with alpha-emitting TRU radionuclides with half-lives greater than 20 years and in concentrations greater than 100 nCi/g of waste matrix at the time of assay. At the Hanford Site, TRU waste also includes  $^{233}\text{U}$  and radium sources in concentrations greater than 100 nCi/g of waste matrix.

#### 1.2 LOW-LEVEL WASTE

Low-level waste is radioactive waste that is less than 100 nCi/g in activity of TRU constituents and is not classified as high-level waste, spent nuclear fuel or TRU waste. Waste with TRU elements that will decay to less than 100 nCi/g within 20 years is considered low-level waste.

#### 1.3 MIXED WASTE

Mixed waste is defined as radioactive waste that contains components that are dangerous materials, as defined by WAC 173-303 (Ecology 1984), which implements the hazardous waste regulations for RCRA. Mixed waste will be either low-level waste or TRU.

### III. DOSE RATES

DOE Order 5820.2A defines TRU waste with a surface dose rate that does not exceed 200 mrem/hr as contact-handled TRU, and TRU waste with an external dose rate in excess of 200 mrem/hr as RH-TRU. TRU waste intended for storage in the TRUSAF is limited to a surface dose rate of 100 mrem/hr (WHC-EP-0063, Rev. 4 [5.5.1.4]). The 100 mrem/hr surface dose rate limitation also applies to CWC (WHC-EP-0063, Rev. 4 [3.7.3.2c]). Presently, the preferred method of packaging

RH-TRU waste is to shield the waste to contact-handled levels and store the shielded waste until facilities are available to reduce the dose rate by an approved decontamination process.

#### IV. CLASSIFIED WASTE

It is anticipated that classified TRU waste will be founded in some of the containers to be retrieved for processing from temporary storage. The retrieval and processing of classified wastes will have additional security implications; therefore, processing will probably include a declassification process. Current plans include processing classified TRU waste at WRAP Facility Module 2B which is not scheduled to be operational until 2008. TRUSAF can provide a secure classified waste storage location necessitated by increased public access to the Hanford Site.

##### Packaging Requirements

#### 1. REQUIREMENTS FOR WASTE PACKAGES

Individual contact-handled TRU waste packages in which the average thermal power density exceeds  $0.1 \text{ watt/ft}^2$  ( $3.5 \text{ watts/m}^2$ ) must have the thermal power recorded in the data package. The design limit for TRUPACT-II shipping container is 40 watts (DOE-WIPP).

Waste packages will not exceed 1,000 Ci of  $^{239}\text{Pu}$  equivalent activity (PE-Ci) (DOE-WIPP [3.4.3.1]) (ref 8).

Waste packages shall not have a maximum surface dose rate at any point greater than 200 mrem/hr. Neutron contributions of greater than 20 mrem/hr to the total waste package dose rate shall be reported in the data package (DOE-WIPP [3.4.4.1]) (ref 8).

Removable surface contamination on waste packages or package assemblies to be emplaced in WIPP shall not be greater than  $50 \text{ pCi/100 cm}^2$  for alpha-emitting radionuclides and  $450 \text{ pCi per 100 cm}^2$  for beta-gamma emitting radionuclides. Fixation of surface contamination to meet the above is not permitted (DOE-WIPP [3.4.5.1]) (ref 8).

For transporting, TRU waste packages will weigh no more than 700 lb/drum for inter-area transfers, and 1,450 lb/drum for intra-area transfers.

Any material that is known or suspected to be contaminated with TRU radioisotopes shall be evaluated by assay, laboratory analysis, or process knowledge as soon as possible in the generating process.

#### 2. WASTE STORAGE CONFIGURATIONS

The 224-T TRUSAF is approved for the assay, RTR, and storage of TRU waste containing all fissionable isotopes of Plutonium,  $^{233}\text{U}$  and  $^{235}\text{U}$ . The gram limits specified for storing these isotopes are the total of the fissionable

material equivalence factors based on  $^{239}\text{Pu}$ , as specified in Appendix C of WHC-EP-0063, Hanford Site Solid Waste Acceptance Criteria.

The CPS for 224-T TRUSAF (CPS-SW-149-00001) allows the 224-T TRUSAF to store TRU waste drums that contain up to 200 g of fissile material in an unlimited array, two drums high (if the fissile material is dispersed over 20% or more of the drum volume). The CPS also allows TRUSAF to store drums containing up to 400 g of fissile material, but the storage is restricted to a one container high 10- by 10-container array with 36-in spacing between arrays. The storage of drums containing over 200 g of TRU greatly restricts the geometric configuration of the storage array, and the total number of drums that can be safely stored. If the TRU waste drums contain hazardous materials (mixed waste), drum stack configuration is further restricted by state regulations to only two drums wide (WAC 173-303-630(5)(c)). The spacing between drum stacks allows for weekly drum inspection requirements (WAC 173-303-630(6)).

The CPS for the CWC (CPS-SW-149-00002) for storage of TRU waste drums allows the storage of TRU waste drums that contain up to 200 g of fissile material (if the fissile material is dispersed over 20% or more of the drum volume), or 100 g of fissile material (if the material occupies less than 20% of the drum volume). If the waste is not mixed waste, the drums can be stacked in an unlimited array, five drums high.

#### V. REFERENCES

1. Atomic Energy Act, 1954, 42 USC 2011 et seq.
2. Comprehensive Environmental Response, Compensation, and Liability Act
3. U.S. Department of Energy, 1991, Waste Acceptance Criteria for the Waste Isolation Pilot Plant, WIPP-DOE-069, Rev. 4, WIPP Project Office, Carlsbad, New Mexico.
4. Resource Conservation and Recovery Act of 1976, 42 USC 6901 et seq.
5. Superfund Amendments and Reauthorization Act of 1986.
6. Washington State Department of Ecology, 1990, "Dangerous Waste Regulations," Washington Administrative Code 173-303, as amended.
7. Westinghouse Hanford Company, 1993, Hanford Site Solid Waste Acceptance Criteria, WHC-EP-0063, Richland, Washington.
8. DOE-WIPP, 1991, Waste Acceptance Criteria for the Waste Isolation Pilot Plant, DOE/WIPP-069, Revision 4, U.S. Department of Energy, WIPP Project Office, Carlsbad, New Mexico.

ANSI MH2 91 ■ 0724150 0506677 3&amp;T ■

ANSI MH2-1991 (3.4)

Revision of  
ANSI MH2-1985 (3.4)**3.4 American National Standard for 55-Gallon (208-Liter) Tight-Head Steel (Double-Seam Chime) Drums (DOT-17C)****3.4.1 General**

The drums covered in 3.4 shall comply with the Department of Transportation Specification 17C.

DOT Specification 17C is published in the *Code of Federal Regulations*, Title 49, Part 178. These supplements, amendments, or reissues to this specification as in effect apply.

**3.4.2 Material**

Material shall be 16-gage steel throughout. Steel may be greater than but may not be less than DOT Designated Gages, as follows:

Gage number	Minimum thickness	
	(in)	(mm)
16	0.0533	1.35

Sheet steel thickness shall be measured at any point no less than 3/8 inch (9.52 mm) from the edge.

**3.4.3 Construction**

Heads shall be double seamed to the body using a nonhardening seaming compound. The side seam shall be welded. Two rolling hoops, expanded or rolled in the drum body, shall be located as shown in the figure.

**3.4.4 Fittings**

One 2-inch (50-mm) and one 3/4-inch (19-mm) fitting shall be mechanically inserted diametri-

cally opposite each other in the top head. Each fitting shall have three or more complete threads in the flange, in accordance with table 6 of *American National Standard Pipe threads, general purpose (inch)*, ANSI/ASME B1.20.1-1983, and shall have sufficient length of thread in the plug so that at least three full threads are engaged when the plug is screwed home with the gasket in place.

**3.4.5 Embossing**

Manufacturers' embossing marks on the bottom head shall be in accordance with applicable items, rules, and regulations.

**3.4.6 Shipping data**

Drums that meet the requirements of 3.4 shall be in accordance with the following:

<b>Volumetric capacity</b>	
Rated (marked) content:	55 gallons (208 liters)
Minimum content:	57.20 gallons (216.5 liters)
Maximum content:	57.75 gallons (218.6 liters)
Minimum weight <sup>1)</sup>	53.6 pounds (24.3 kilograms)
<b>Ocean shipping cube</b>	
Tweed's Accurate:	10.715 cubic feet
Atlantic Westbound:	0.316 600 cubic meter

NOTE - These are not direct conversions. See clause 2 for calculation.

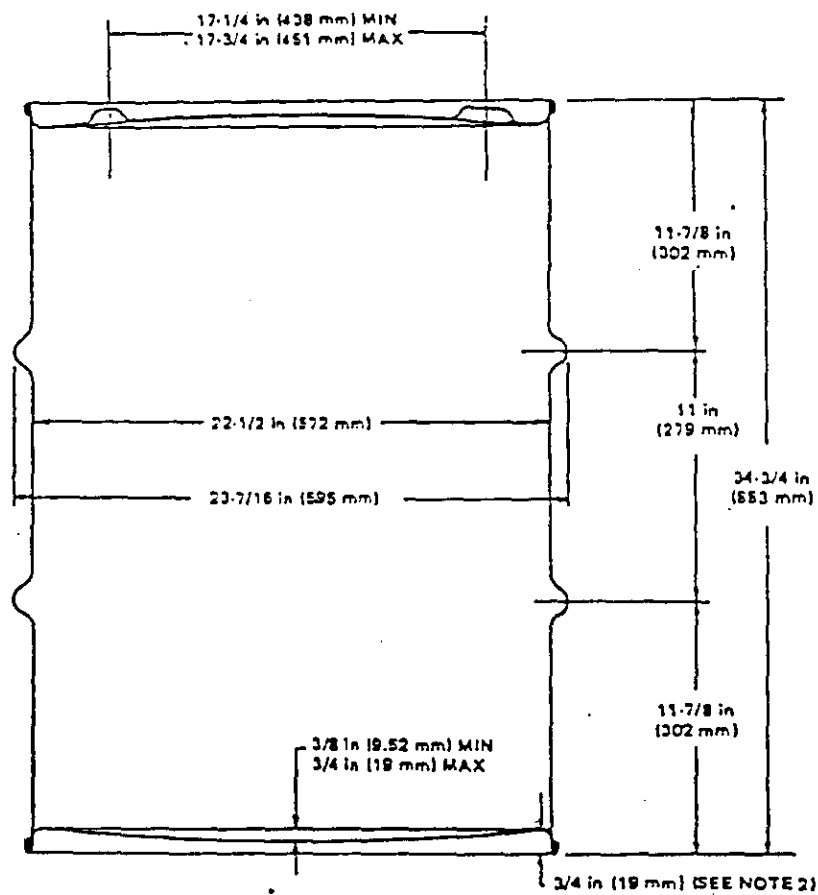
<sup>1)</sup> Minimum weight is calculated on the basis of steel being minimum thickness with metal fittings; actual container weight may exceed the minimum depending upon actual steel thickness used.

ANSI MH2 91 ■ 0724150 0506676 216 ■

ANSI MH2-1991

**3.4.7 Tolerances**

Diameter over rolling hoops.....	23-13/32 in (595 mm) minimum 23-15/32 in (596 mm) maximum
Overall height.....	34-3/4 in $\pm$ 1/8 in (883 mm $\pm$ 3.18 mm)
All other height dimensions .....	$\pm$ 1/8 in ( $\pm$ 3.18 mm)
Center-to-center fitting .....	17-1/2 in $\pm$ 1/4 in (444 mm $\pm$ 6.35 mm)
Convexity of each head.....	9/16 in $\pm$ 3/16 in (14.3 mm $\pm$ 4.76 mm)
All other dimensions.....	$\pm$ 1/16 in ( $\pm$ 1.59 mm)

**NOTES:**

- (1) All metric units are rounded, where required, in accordance with the procedure given in 2.2.1.2.
- (2) This dimension is applicable to both the top and bottom heads.

ANSI MH2 91 0724350 0506679 152

## ANSI MH2-1891 (3.5)

Revision of  
ANSI MH2-1965 (3.5)

3.5 American National Standard for 55-Gallon (208-Liter) Full-Removable-Head Steel (Double-Seam Chime) Drums (DOT-17H, UFC-Rule 40, NMFC-Item 260)

## 3.5.1 General

The drums covered in 3.5 shall comply with:

- Department of Transportation Specification 17H, or
- Rule 40 of the Uniform Freight Classification, or
- Item 260 of the National Motor Freight Classification

DOT Specification 17H is published in the *Code of Federal Regulations*, Title 49, Part 178; Rule 40 by the National Railroad Freight Committee, agency of the railroads; Item 260 by the National Classification Board of the motor carrier industry. These supplements, amendments, or releases to these specifications as in effect apply.

## 3.5.2 Material

Material shall be 18-gage steel body and bottom head with 16-gage steel top head and 12-gage steel closing ring. Steel may be greater than but may not be less than DOT Designated Gages, as follows:

Gage number	Minimum thickness	
	(in)	(mm)
12	0.0946	2.40
16	0.0533	1.35
18	0.0428	1.09

Sheet steel thickness shall be measured at any point no less than 3/8 inch (9.52 mm) from the edge.

## 3.5.3 Construction

The bottom head shall be double seamed to the body using a nonhardening seaming com-

pound. The side seam shall be welded. The top of the shell, or body, shall be of steel, rolled to form a 1/2-inch (12.7-mm) false wire. The top head shall be fully removable, convex, and 7/8 inch (22.2 mm) deep, with one or more corrugations near the periphery. The top head shall fit over the rolled false wire at the open end of the drum, shall be sealed with a gasket of material resistant to the product to be packed, and shall be secured to the rolled false wire by a closing ring or other device. Three rolling hoops, expanded or rolled in the drum body, shall be located as shown in the figure.

## 3.5.4 Embossing

Manufacturers' embossing marks on the bottom head shall be in accordance with applicable items, rules, and regulations.

## 3.5.5 Shipping data

Drums that meet the requirements of 3.5 shall be in accordance with the following:

Volumetric capacity	
Rated (marked) content:	55 gallons (208 liters)
Minimum content:	57.20 gallons (216.5 liters)
Maximum content:	57.75 gallons (218.6 liters)
Minimum weight <sup>1)</sup>	48.6 pounds (22.0 kilograms)
Ocean shipping cube	
Tweed's Accurate:	11.667 cubic feet
Atlantic Westbound:	0.327 448 cubic meter

NOTE - These are not direct conversions. See clause 2 for calculation.

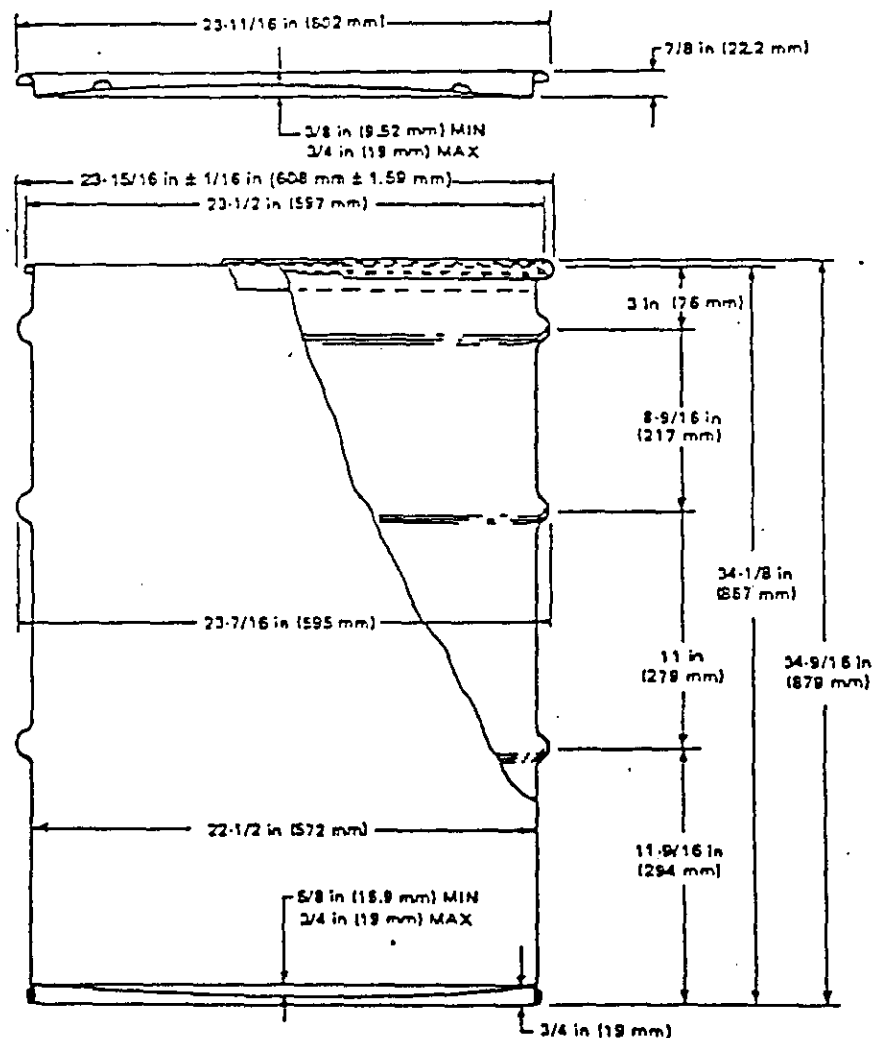
<sup>1)</sup> Minimum weight is calculated on the basis of steel being minimum thickness with metal fittings plus a 12-gage steel DOT 17H bolted ring; actual container weight may exceed the minimum depending upon actual steel thickness used.

ANSI MH2 91 ■ 0724150 0508660 974 ■

ANSI MH2-1991

**3.5.6 Tolerances**

Diameter over locking ring.....	23-15/16 in $\pm$ 1/16 in (608 mm $\pm$ 1.59 mm)
Diameter over rolling hoops.....	23-13/32 in (595 mm) minimum 23-15/32 in (596 mm) maximum
Diameter over false wire.....	23-1/2 in $\pm$ 1/16 in (597 mm $\pm$ 1.59 mm)
Overall height.....	34-9/16 in $\pm$ 1/8 in (879 mm $\pm$ 3.18 mm)
Height, cover off.....	34-1/8 in $\pm$ 1/8 in (867 mm $\pm$ 3.18 mm)
All other height dimensions.....	$\pm$ 1/8 in ( $\pm$ 3.18 mm)
Convexity of top head.....	9/16 in $\pm$ 3/16 in (14.3 mm $\pm$ 4.76 mm)
Convexity of bottom head.....	11/16 in $\pm$ 1/16 in (17.5 mm $\pm$ 1.59 mm)
All other dimensions.....	$\pm$ 1/16 in ( $\pm$ 1.59 mm)



NOTE: All metric units are rounded, where required, in accordance with the procedure given in 2.2.1.2.

ANSI MH2 51 ■ 0724150 0508685 436 ■

ANSI MH2-1991 (3.6)

Revision of  
ANSI MH2-1965 (3.6)

### 3.8 American National Standard for 55-Gallon (208-Liter) Full-Removable-Head Steel (Round-Seam Chime) Drums (DOT-17H, UFC-Rule 40, NMFC-Item 260)

#### 3.8.1 General

The drums covered in 3.8 shall comply with:

- Department of Transportation Specification 17H, or
- Rule 40 of the Uniform Freight Classification, or
- Item 260 of the National Motor Freight Classification

DOT Specification 17H is published in the *Code of Federal Regulations*, Title 49, Part 178; Rule 40 by the National Railroad Freight Committee, agency of the railroads; Item 260 by the National Classification Board of the motor carrier industry. These supplements, amendments, or reissues to these specifications as in effect apply.

#### 3.8.2 Material

Material shall be 18-gage steel body and bottom head with 16-gage steel top head and 12-gage steel closing ring. Steel may be greater than but may not be less than DOT Designated Gages, as follows:

Gage number	Minimum thickness	
	(in)	(mm)
12	0.0946	2.40
16	0.0533	1.35
18	0.0428	1.09

Sheet steel thickness shall be measured at any point no less than 3/8 inch (9.52 mm) from the edge.

#### 3.8.3 Construction

The bottom head shall be seamed to the body using a nonhardening seaming compound.

The side seam shall be welded. The top of the shell, or body, shall be of steel, rolled to form a 1/2-inch (12.7-mm) false wire. The top head shall be fully removable, convex, and 7/8 inch (22.2 mm) deep, with one or more corrugations near the periphery. The top head shall fit over the rolled false wire at the open end of the drum, shall be sealed with a gasket of material resistant to the product to be packed, and shall be secured to the rolled false wire by a closing ring or other device. Three rolling hoops, expanded or rolled in the drum body, shall be located as shown in the figure.

#### 3.8.4 Embossing

Manufacturers' embossing marks on the bottom head shall be in accordance with applicable items, rules, and regulations.

#### 3.8.5 Shipping data

Drums that meet the requirements of 3.8 shall be in accordance with the following:

Volumetric capacity	
Rated (marked) content:	55 gallons (208 liters)
Minimum content:	57.20 gallons (216.5 liters)
Maximum content:	57.75 gallons (218.6 liters)
Minimum weight <sup>1)</sup>	48.0 pounds (21.8 kilograms)
Ocean shipping cube	
Tweed's Accurate:	11.333 cubic feet
Atlantic Westbound:	0.323 727 cubic meter

NOTE — These are not direct conversions. See clause 2 for calculation.

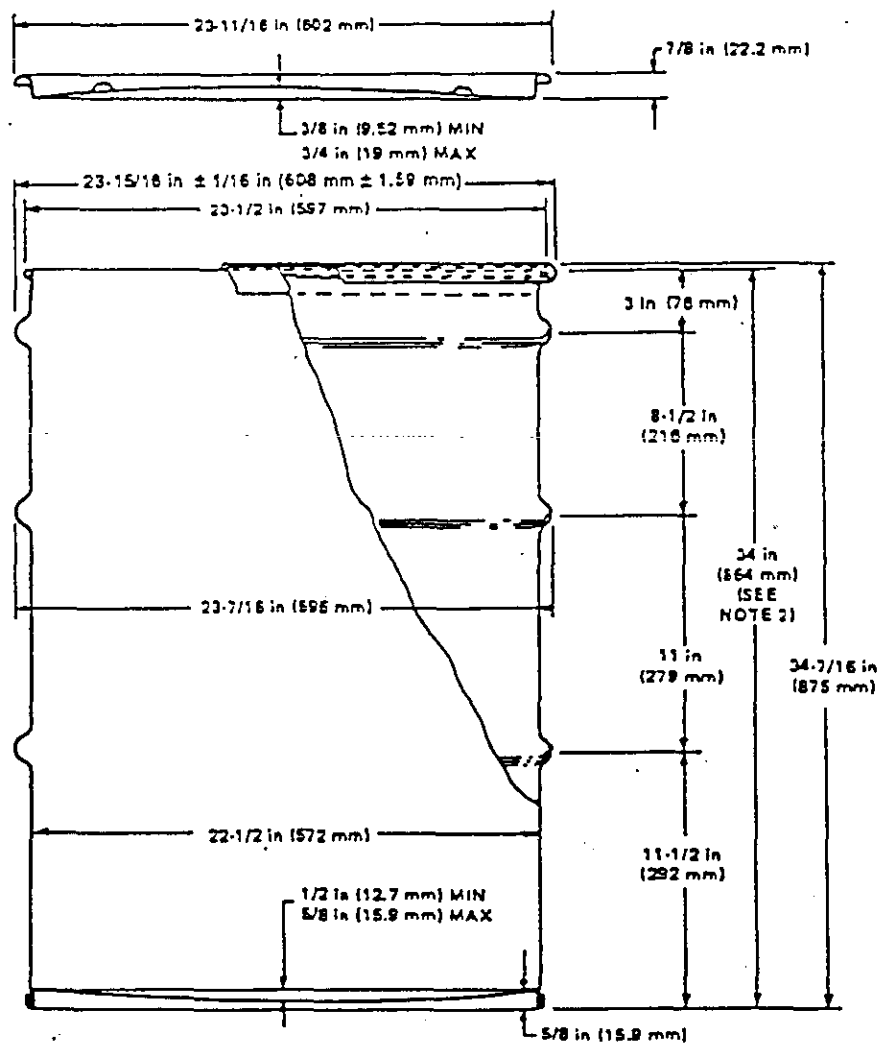
<sup>1)</sup> Minimum weight is calculated on the basis of steel being minimum thickness with metal fittings plus a 12-gage steel DOT 17H bolted ring; actual container weight may exceed the minimum depending upon actual steel thickness used.

ANSI MH2 91 ■ 0724150 0508686 392 ■

ANSI MH2-1991

**3.8.6 Tolerances**

Diameter over locking ring.....	23-15/16 in $\pm$ 1/16 in (608 mm $\pm$ 1.59 mm)
Diameter over rolling hoops.....	23-13/32 in (595 mm) minimum 23-15/32 in (596 mm) maximum
Diameter over false wire.....	23-1/2 in $\pm$ 1/16 in (597 mm $\pm$ 1.59 mm)
Overall height.....	34-7/16 in $\pm$ 1/8 in (875 mm $\pm$ 3.18 mm)
Height, cover off.....	34 in $\pm$ 1/8 in (864 mm $\pm$ 3.18 mm)
All other height dimensions .....	$\pm$ 1/8 in ( $\pm$ 3.18 mm)
Convexity of top head.....	9/16 in $\pm$ 3/16 in (14.3 mm $\pm$ 4.76 mm)
Convexity of bottom head.....	9/16 in $\pm$ 1/16 in (14.3 mm $\pm$ 1.59 mm)
All other dimensions.....	$\pm$ 1/16 in ( $\pm$ 1.59 mm)

**NOTES:**

- (1) All metric units are rounded, where required, in accordance with the procedure given in 2.2.1.2.
- (2) The overall height is the controlling dimension and does not equal the sum of the increments.

ANSI MH2 91 0724150 0506667 229

ANSI MH2-1991 (3.9)

Revision of  
ANSI MH2-1985 (3.9)

### 3.9 American National Standard for 55-Gallon (208-Liter) Full-Removable-Head Steel (Double-Seam Chime) Drums (DOT-17C, UFC-Rule 40, NMFC-Item 260)

#### 3.9.1 General

The drums covered in 3.9 shall comply with:

- Department of Transportation Specification 17C, or
- Rule 40 of the Uniform Freight Classification, or
- Item 260 of the National Motor Freight Classification

DOT Specification 17C is published in the *Code of Federal Regulations*, Title 49, Part 178; Rule 40 by the National Railroad Freight Committee; Item 260 by the National Motor Freight Traffic Association. These supplements, amendments, or reissues to these specifications as in effect apply.

#### 3.9.2 Material

Material shall be 16-gage steel body and bottom head with 16-gage steel top head and 12-gage steel closing ring. Steel may be greater than but may not be less than DOT Designated Gages, as follows:

Gage number	Minimum thickness	
	(in)	(mm)
12	0.0946	2.40
16	0.0533	1.35

Sheet steel thickness shall be measured at any point no less than 3/8 inch (9.52 mm) from the edge.

#### 3.9.3 Construction

The bottom head shall be seamed to the body using a nonhardening seaming compound.

The side seam shall be welded. The top of the shell, or body, shall be of steel, rolled to form a 1/2-inch (12.7-mm) false wire. The top head shall be fully removable, convex, and 7/8 inch (22.2 mm) deep, with one or more corrugations near the periphery. The top head shall fit over the rolled false wire at the open end of the drum, shall be sealed with a gasket of material resistant to the product to be packed, and shall be secured to the rolled false wire by a closing ring or other device. Three rolling hoops, expanded or rolled in the drum body, shall be located as shown in the figure.

#### 3.9.4 Embossing

Manufacturers' embossing marks on the bottom head shall be in accordance with applicable items, rules, and regulations.

#### 3.9.5 Shipping data

Drums that meet the requirements of 3.9 shall be in accordance with the following:

Volumetric capacity	
Rated (marked) content:	55 gallons (208 liters)
Minimum content:	57.20 gallons (216.5 liters)
Maximum content:	57.75 gallons (218.8 liters)
Minimum weight <sup>1)</sup>	57.4 pounds (26.0 kilograms)
Ocean shipping cube	
Tweed's Accurate:	11.333 cubic feet
Atlantic Westbound:	0.323 727 cubic meter

NOTE - These are not direct conversions. See clause 2 for calculation.

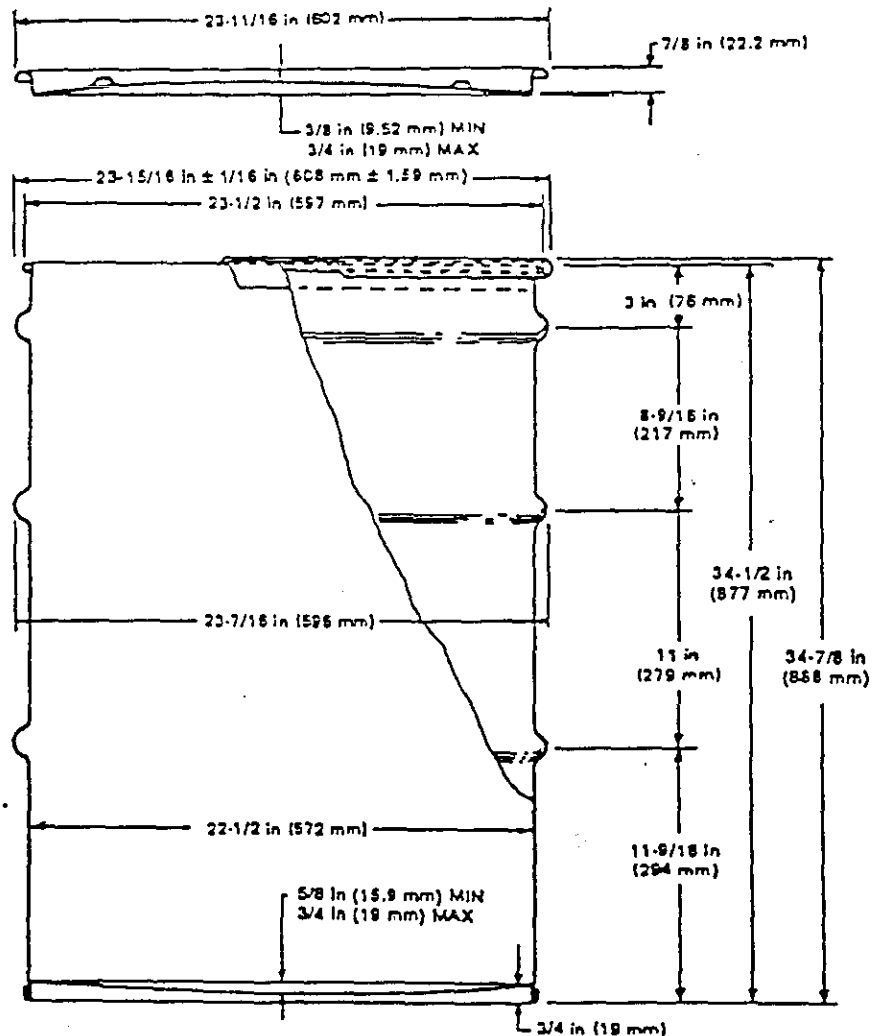
<sup>1)</sup> Minimum weight is calculated on the basis of steel being minimum thickness with metal linings plus a 12-gage steel DOT 17C bolted ring; actual container weight may exceed the minimum depending upon actual steel thickness used.

ANSI MH2 91 0724150 0508888 165

ANSI MH2-1991

**3.9.6 Tolerances**

Diameter over locking ring .....	23-15/16 in $\pm$ 1/16 in (608 mm $\pm$ 1.59 mm)
Diameter over rolling hoops .....	23-13/32 in (595 mm) minimum
	23-15/32 in (596 mm) maximum
Diameter over false wire .....	23-1/2 in $\pm$ 1/16 in (597 mm $\pm$ 1.59 mm)
Overall height .....	34-7/8 in $\pm$ 1/8 in (886 mm $\pm$ 3.18 mm)
Height, cover off .....	34-1/2 in $\pm$ 1/8 in (877 mm $\pm$ 3.18 mm)
All other height dimensions .....	$\pm$ 1/8 in ( $\pm$ 3.18 mm)
Convexity of top head .....	9/16 in $\pm$ 3/16 in (14.3 mm $\pm$ 4.76 mm)
Convexity of bottom head .....	11/16 in $\pm$ 1/16 in (17.5 mm $\pm$ 1.59 mm)
All other dimensions .....	$\pm$ 1/16 in ( $\pm$ 1.59 mm)



NOTE: All metric units are rounded, where required, in accordance with the procedure given in 2.2.1.2.

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## APPENDIX C

### Projected Solid Waste Feed Stream

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## PROJECTED SOLID WASTE FEED STEAM

The upgrade of the TRUSAF to extend the life of the facility is proposed at this time because the facility is presently the only licensed facility for receiving TRU and TRU-mixed waste that has a maximum 400 gram fissile load limit per drum. Upgrades have been made to TRUSAF to assure acceptable operation of the facility until the verification assay and RTR operations can be relocated to WRAP Facility Module 1. The characterization records of drums received at TRUSAF are verified by assay and RTR for compliance with waste receiving requirements. Drums properly characterized and within the storage limits of CWC can be transferred to the CWC storage facilities. Drums with characterization records that cannot be verified by nondestructive methods, or where the activity of the drum contents exceed the CWC storage limits, must be stored at TRUSAF until WRAP Module 1 becomes operational. When WRAP Module 1 is operational, the contents of the drums stored in TRUSAF can be processed for disposal. Normally, the drum gram load limit for waste processed at WRAP Module 1 will be 200 g of fissile material; however, provisions have been provided to process special cases where drum fissile content is above 200 g.

Present plans for disposal of TRU/TRU-mixed waste are predicated on the opening of the WIPP in the year 2000, with the initial shipments of TRU/TRU-mixed from the Hanford Site to start in the year 2002. According to preliminary Scenario 7.1 Case Study of the Solid Waste Projection Model, Phase I through V Storage Facilities should be adequate for storage of all of the solid waste drums through the year 2003. If the WIPP opening is delayed, additional storage space for the accumulation of TRU/TRU-mixed waste will be required.

The requirements for additional storage space increases rapidly after retrieval starts and WRAP Module 1 becomes operational. The planned storage facilities for solid waste will provide storage for 79,500 drum equivalents by the year 1998. A delay in the operational startup of the WIPP will impact the amount of additional storage capacity that will be necessary. TRU in drums represents only about 4 percent of the solid waste quantities that will be stored. Processing the TRU/TRU-mixed to the WIPP waste acceptance criteria will approximately double the volume of the original TRU/TRU-mixed waste. Because of the doubled volume of processed TRU/TRU-mixed waste, the TRU/TRU-mixed waste in storage will probably not be processed until the WIPP opening is assured and an approved WIPP waste acceptance criteria is issued.

The 224-T TRUSAF presently has the capacity to store about 2,000 waste drums. If the cell area of the 224-T TRUSAF were decontaminated and converted to a drum storage area, it could accommodate an estimated additional 3,000 drums. The addition of a 3,000-drum storage capacity is insignificant in light of the overall forecasted storage capacity requirements which have been estimated. However, the 224-T TRUSAF could continue be utilized to temporarily store TRU/TRU-mixed waste drums that require special considerations for storage. Two types of waste that could require special storage considerations until WRAP Module 2B is operational in 2008 would be waste drums that have high TRU content in the waste, and/or security classified TRU waste.

TRU waste drums that contain between 200 and 400 g of fissile material can be stored at the 224-T TRUSAF. Based on the historical data contained in WHC-EP-0225 the estimated drums in retrievable storage, containing 100 g or more of certified TRU materials will be approximately 1,414 drums, with 34 of the drums containing between 200 and 400 g of TRU waste. The actual number of drums containing security classified waste has not been determined at this time. The solid waste information tracking system lists 973 drums contain security classified waste; however, estimates exceed 1,200 drums. These drums are candidates for storage at 224-T TRUSAF until they can be processed through WRAP Module 2B.

The amount of storage for TRU/TRU-mixed waste drums that will be required each year is shown in Table C-1. The annual storage requirement column reflects the yearly projection of quantities of TRU/TRU-mixed waste drums that will be in storage before and during the processing of the waste in the WRAP Modules 1 and 2B facilities. The annual shipments to WIPP column shows the quantities of repackaged TRU/TRU-mixed waste drums that will be disposed of at WIPP. The data assumes that shipments to the WIPP will start in 2002 and that the yearly shipment quantities are sustainable. The shipping rates that approaching 9,000 drums/yr may not be achievable, resulting in an adverse impact on available drum storage.

Table C-1. TRU Waste for Processing, Storage, and Disposal.

Year	Annual Storage Requirements for Contact-Handled TRU/TRU-Mixed in Drums	Annual Contact-Handled TRU/TRU-Mixed Drum Shipments to WIPP
1994	3,182	0
1995	4,339	0
1996	5,255	0
1997	6,046	0
1998	6,705	0
1999	7,835	0
2000	10,063	0
2001	11,578	0
2002	10,273	2,945
2003	6,581	5,842
2004	4,162	5,649
2005	5,451	1,965
2006	5,926	5,926
2007	5,248	1,964
2008	5,725	1,956
2009	7,189	3,092
2010	8,512	5,510
2011	8,970	7,738
2012	8,020	8,854
2013	6,454	8,627
2014	6,003	6,806
2015	5,964	6,830
2016	5,538	7,234
2017	5,026	6,986
2018	5,024	6,395
2019	4,801	6,440
2020	2,454	3,623
2021	3,609	0
2022	4,762	0
2023	5,916	0
TOTAL	N/A	100,413

Westinghouse Hanford Company(b), 1989, Criticality Prevention Specification, CPS-SW-149-00001, Richland, Washington.

Westinghouse Hanford Company(c), 1993, Criticality Prevention Specification, CPS-SW-149-00002, Richland, Washington.

Westinghouse Hanford Company(a), 1994, Internal Memo, Special Solid Waste Projection Model Report, 87320-94-RSK-025, Richland, Washington.

## APPENDIX D

### Facility Upgrades, Phase I

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## 1.0 ROOF AND EXTERIOR WALLS

### 1.1 ROOF

The existing roof is a built-up flat roof of hot tar and gravel. There have been reports of leaks in the roof during heavy rains.

Access for construction to the roof is not advisable because of the condition of the roof. Additionally, the level of radiation at the section of the roof located above the cells may not allow personnel access. Accordingly, it is proposed that no work be done to repair the present roof but a new roof be constructed over the present roof. The new roof will be supported on buttresses constructed on the side walls of the building and light weight steel trusses resting on the buttresses. The roofing structure will be designed with adequate sloping to provide good water runoff. The trusses will be covered by metal roofing.

The proposed new roof is shown in Sketch 224-T-CS-001. (All sketches are located in Appendix A.)

### 1.2 EXTERIOR WALLS

The walls of the building originally consisted of filler blocks installed between the cast in place concrete columns and beams. These blocks were subsequently removed and replaced with reinforced concrete. The concrete has now shrunk and gaps have developed between the columns and the concrete filler. During heavy rains water seeps into the building through these joints.

It is proposed to seal the joints between the concrete columns and beams and the poured-in-place concrete filler. Approximate joint lengths are as follows:

$$\begin{array}{rcl} 6 \text{ each} \times 197 \text{ ft} & = & 1,182 \text{ ft} \\ 6 \text{ each} \times 33 \text{ ft} & = & 198 \text{ ft} \\ 14 \text{ each} \times 12 \text{ ft} & = & 168 \text{ ft} \end{array}$$

---


$$\text{Total lin ft} = 1,548 \text{ ft}$$

Height of scaffolding will range from ground level to + 36 ft above grade.

## 2.0 LOADING DOCK

A 45-in. high concrete truck loading dock will be constructed at the south end of the building at the point of the existing roll-up door. It will measure approximately 100 ft<sup>2</sup> and be equipped with truck bumpers, bed elevation adjustment, metal roof and sides for wind and weather protection.

A down ramp or hydraulic controlled drum lift will be provided to transfer the drums from the loading dock to 0 ft - 0 in. level.

### 3.0 AIR LOCKS

The safety analysis report requires that the storage area be maintained at an air pressure of -0.5 in. WG with respect to the outside air pressure, and that the cells be maintained at -0.3 in. WG with respect to the storage area. The Dangerous Waste Permit (Johnson 1992) also states that the building will be maintained at a negative pressure with respect to the atmosphere.

The two vestibules at the personnel entrances are enclosed and maintained at a positive pressure with respect to the atmosphere and 224-T TRUSAF. This is consistent with the design philosophy of the negative building pressure and filtered exhaust. The southwest receiving entrance and roll-up door do not conform to this philosophy. It is therefore recommended that a drive-in airlock be provided at the receiving entrance, and that the roll-up door be sealed. For estimating purposes, it is assumed that the drive-in airlock will measure 15 ft long by 8 ft wide by 10 ft high. It is also recommended that alarms be installed on all airlocks that sound when both doors are open simultaneously.

### 4.0 ELECTRICAL SYSTEM

The present electrical system was installed some 50 years ago and reflects the technology and materials available at the time. The power distribution panels are equipped with fuses and the cable insulation has exceeded its design life. The following electrical upgrades are proposed. The quantities shown are not design verified but are assumed for cost estimating purposes.

#### 4.1 Install the following power distribution equipment:

- Two power transformers, each of 500 kVA, 13.8 kV - 480 Y/277 Vac. The transformers will be mounted on concrete pads outside the 224-T TRUSAF. Each transformer will be supplied from a separate source to provide back-up to each other.
- The proposed power system is shown on the one-line diagram in Sketches 224-T-ES-001, Sh 1 and 2.

#### 4.2 Install one switchgear assembly, 480 Y/277 Vac, 1,000 A rating with the following:

- Main circuit breaker to be 1,000 AF, branch circuit tied to the primary source of power.
- A 1,000 AF tie breaker connected to the secondary source of power.
- Branch circuit breakers.
- The switchgear assembly will include a space for a future power circuit breaker which will serve as the main circuit breaker for the power system for the Hot Cell area.

#### 4.3 Install one 480 Vac 3-phase, 600 A motor control center.

- 4.4 Install two 480 - 208Y/120 Vac, 45 kVA dry type transformers each of which will supply a 208Y/120 Vac panel board.
- 4.5 Install a 5 kVA UPS system which will meet the facilities instrumentation requirements.
- 4.6 The entire electrical wiring system of the facility will be replaced by installing new wiring in conduit. The present wiring can either be removed or abandoned in place. Assume the installation of 2,000 ft of 1-in. conduit and 500 ft of 2-in. conduit. Also assume 10,000 ft of #12 AWG wire and 2,000 ft of #4 AWG.

## 5.0 HEATING, VENTILATING, AND AIR-CONDITIONING SYSTEM

The present airflow configuration of the facility is shown on Sketch 224-T-MS-001. Sketches 224-T-MS-002 and 224-T-MS-003 show proposed HVAC modifications.

### 5.1 Transite Ducting

Some of the 224-T TRUSAF supply ductwork is transite (asbestos cement). This ductwork is located on the first floor and supplies air directly to most of the floor. It also acts as a header for the supply ductwork in the rest of the building. During a past system modification some of the original asbestos ductwork was removed. Asbestos associated with the supply air handling unit has also been replaced.

The concern with the transite supply ducting is that air erosion could cause asbestos fibers to become airborne and be sent to the worker breathing space. This is especially likely to occur if the asbestos can be crumbled by hand pressure (is friable). Recently the dust in the 224-T TRUSAF HVAC supply system was sampled and tested for asbestos content (Thomas 1993). Only one of the four samples taken had asbestos in it, and only a trace content was detected. It is therefore expected that we have a nonfriable case.

Regardless of the sampling results, to absolutely prevent erosion two methods of asbestos abatement are considered: 1) replace the transite ductwork and 2) remove duct panels to access the interior of the duct, to encapsulate the interior with a fixant to prevent erosion; and then to replace the removed transite panels with metal panels (ICF KH 1992). Abatement work could be completed during a moderate season when the facility does not require operating the HVAC supply system, so that minimal disturbance of facility operations would occur. After abatement the entire duct system would be vacuumed.

Also to be considered is the current Hanford Site Asbestos Abatement Plan, WHC-EP-0390 (WHC 1993). Prior to the recent testing, the 224-T TRUSAF supply ductwork was assumed to contain friable asbestos. The building is therefore listed in WHC-EP-0390 as a Class A1 facility, indicating a high potential for asbestos exposure. Abatement in class A1 facilities is to take place before FY98. The plan is updated annually, and is due to be updated in the fall of 1994. A change in 224-T TRUSAF classification is expected.

It is also useful to compare this ductwork with similar ductwork onsite. The 271-U Building ductwork is such a case. While the ductwork is similar, dust sample test results for 271-U are quite different from those of 224-T TRUSAF discussed above. Significant asbestos was found in dust samples from the 271-U ductwork (Thomas 1992). The interior of the 271-U ductwork has since been encapsulated.

Based on the difference in test results between the 224-T TRUSAF samples and the 271-U samples, it has been proposed in an internal memo (Hapke 1993) that no asbestos abatement is necessary for the 224-T TRUSAF ductwork. The memo also states that routine periodic air monitoring for asbestos fibers is planned, which is intended to check the safety of the workspace air. The conservative approach,

however, would be to ensure that no erosion takes place by removing or encapsulating the interior of the duct.

The present report proposes to replace the ductwork. This entails the replacement of some 200 ft of ductwork.

## **5.2 Ventilation Fans**

The fans have been in service for over 25 years and will need replacement over the next 30 years.

It is proposed to replace the two exhaust fans with like fans.

## **5.3 Preheat System Coils**

The preheat system coils of the supply air handling unit are very old and should be replaced.

For estimating purposes, it is assumed that the preheat coils raise 37,700 scfm, 30°F (11 to 40°F) with steam at 110 psi similar to wing 1FB F-114).

## **5.4 HEPA Filter Assemblies**

While many advantages would be gained by replacing the exhaust HEPA filter system with a new system meeting today's standards (ASME N509 and N510), this is an existing facility and full compliance with current standards is not required. Furthermore, facility safety analysis report (Pines 1987) states that loss of drum containment will not be a likely event during storage, and that contamination in the sealed process cells is fixed. The HEPA filtered exhaust is therefore an extra measure of safety.

A visual inspection of the outside of the HEPA filter housings revealed that two upgrades are necessary. These two upgrades are the only upgrades considered necessary for the continued operation of the system.

First, port labels need to be provided, and missing screws on the test ports need to be replaced. The port labels need to specify how each port is to be used during the in-place leak test to assure consistency between tests.

Second, new ports need to be added to the duct between the F cell HEPA filter box and the building common exhaust plenum. These ports are necessary to properly perform the annual HEPA filter aerosol leak test. The ports will be used to obtain the filter bank flow rate for the test, and one of the ports will be used for the baseline test.

New flow test ports are needed because the existing flow test ports are located immediately downstream of the flow disturbance. The new ports should be located per Chapter 9 of the ACGIH Industrial Ventilation Manual (ACGIH 1988).

While ASME N510 requires baselining upstream of the filter bank, this standard is new criteria. The F cell HEPA filter system configuration will not allow the addition of an upstream aerosol injection port in a location such that an upstream baseline sample can be taken. Air enters the filter box directly from F cell below. However, the past site standard has been to design systems so that the baseline is taken downstream of the filter bank (Johnson 1980). Downstream baselining using a new port for the baseline sample is adequate for continued operation of the system.

The new ports should be located close to the exhaust plenum to obtain the best baseline sample and test sample possible. After installing the new ports an ASME N510 aerosol distribution test should be conducted for the downstream baseline to determine if a mixer plate is necessary.

#### **5.5 Exhaust Stack and Stack Sampling**

The existing stacks discharge horizontally and have sample probes immediately downstream of the fans. While neither 40 CFR 61 nor WHC-CM-7-5 require that the stacks or samplers be redesigned, and careful review of the codes reveals that the location of the sample probes is not prescribed unless the extraction is for a CAM from a NESHAP stack, the design can clearly be improved.

It is proposed to modify the stack to provide vertical discharge by constructing an exhaust stack on the roof of the building.

#### **5.6 Outside Air Pressure Reference System**

The outside air pressure sensor opening is restricted with duct tape. Apparently the sensor allowed too much fluctuation due to wind. There are commercially available outside air sensors that compensate for wind velocity and direction. For example, a sensor similar to the static outside air probe manufactured by Air Monitoring Corporation could be mounted 15 to 18 ft above the top of the building using approximately 50 ft of 2-in. pipe.

#### **5.7 Heating**

The entire building is presently heated by with steam. This is not a storage requirement and it is not a energy efficient operation. The office and drum analysis area are the only areas that should be heated.

It is proposed that the steam system be disconnected from the building and a heating system consisting of an electric heat pump and supporting electrical furnace be installed for the offices and the drum analysis areas only.

This activity could be postponed until the steam plants in the 200 East and 200 West Areas are removed from service. For planning purposes however this effort is included in the cost estimate.

For estimating purposes, approximately 19 tons of cooling will be required and approximately 140 ft of supply ducting will be redesigned.

## 6.0 ELEVATOR

The 224-T TRUSAF has one elevator and it is essentially used for drum and fork lift transfers between floors. It is an electric powered, 50 FPM rated speed, 8,000 lb rated load, freight elevator made by Houghton and installed some 50 years ago.

The codes and standards that apply to this elevator are ANSI A17.1 and 17.2, and WAC 296-95.

On April 28, 1993, an annual inspection per ANSI A17.1 and A17.2 was performed by Montgomery Elevator Company. Four nonsafety related deficiencies were identified by the Inspector. The stop switch on the top of the car needs to be clearly labeled per ANSI A17.1, Rule 210 (e). A permanent light fixture needs to be provided in the pit per ANSI A17.1, Rule 106.1 (e). A stop switch needs to be provided in the pit per ANSI A17.1, Rule 106.1 (f). A ladder needs to be provided for pit access per ANSI A17.1, Rule 106.1(d).

Per WAC 296-95-101, these are the minimum standards for all existing electric elevators. Some design requirements (cable specifications, wiring diagram, etc.) cannot be easily verified in the field for old elevators. According to the Thomas Register, the Houghton Company no longer exists. The ANSI inspection discussed above covers the reasonably verifiable requirements.

This limited size of the car presents an operational problem. However, since the existing shaft which houses the elevator is concrete, enlarging the shaft to accommodate a larger elevator poses a major effort; accordingly, no change to car size is proposed at this time. Instead, it is proposed that an additional drum transfer system consisting of a dumbwaiter be constructed on the southwest side of the building. This elevator will be constructed outside the building as shown on Sketch 224-T-CS-001.

As part of this effort it proposed that, in addition to the upgrades discussed above for compliance with ANSI, the hoisting, electrical and control systems be replaced.

## 7.0 SECURITY SYSTEM

At present, there are four doors which provide access to the gallery portion of the building; one double wide door and two standard size metal personnel access doors.

It is proposed to replace the wooden with metal doors. Additionally, it is proposed that the doors be equipped with some type of access control system (key card or equivalent) and intrusion alarm.

The door alarm system will be connected to a manned remote station via the HLAN system.

## 8.0 COMMUNICATION SYSTEM

At present, there is no HLAN service to the building. It is proposed to connect the building to the sitewide HLAN service. This will provide a channel for transmitting security alarms from the building to an offsite station.

## 9.0 FIRE ALARM SYSTEM

The fire protection and detection system is over the next 30 years and will require updating to comply with changing requirements. For estimating purposes, it is assumed that a totally new fire detection and alarm system will be installed.

A smoke detector will also be located in the duct (reference Drawing H-2-36218).

## 10.0 INVENTORY CONTROL SYSTEM

Install bar scanner and supporting computer equipment for computerized site-wide storage and inventory control of waste materials.

The system will be connected to a reporting station (TBD) through the HLAN system.

## 11.0 RADIATION AND HAZARDOUS GAS MONITORS

Design, purchase, and install radiation and hazardous gas monitors in return air ducts or in individual areas or rooms in drum storage areas.

## 12.0 REFERENCES

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- (7) Pines, A. G., TRUSAF Hazards Identification and Evaluation, SD-WM-SAR-025, dated October 1, 1987.
- (8) Johnson, K. D., Functional Design Criteria for Enhanced Radioactive and Mixed Waste Storage Phase V, WHC-SD-W112-FDC-001, dated April 23, 1992.

- (9) Greager, T. M., Conceptual Design Report for Enhanced Radioactive and Mixed Waste Storage Phase V Project W-112, WHC-SD-W112-CDR-001, dated June 8, 1992.
- (10) U.S. Department of Energy, Richland Operations Office, 1992, 224-T Transuranic Waste Storage and Assay Facility Dangerous Waste Application, DOE/RL-91-51, dated June 1992.
- (11) ACGIH, 1988, Industrial Ventilation 20th Edition, American Conference of Governmental Industrial Hygienists, Inc, Cincinnati, Ohio, Copyright 1988.
- (12) Johnson, L. L., 1980, Rockwell Hanford Operations, to D. E. Anderson, Vitro Engineering Corporation, DOP Test Ports - Uniform Design, dated September 30, 1980.

## APPENDIX E

### Decontamination of Hot Cell Area

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## 1.0 INTRODUCTION

### 1.1 BACKGROUND

The 224-T Building was constructed in the 1940's to decontaminate and concentrate plutonium solution from the bismuth phosphate process in T Plant. The building is divided into two sections by a 1-ft thick concrete wall which bisects the building in a east to west direction. The northern section of the building is divided into three floors and is presently used to store solid waste in drums. The southeast section of the building consists mainly of six process cells.

Originally, five of the six cells were used in the process mentioned above; B cell was available as a backup for D and E cells. Changes in the processing operations in 221-T resulted in a greater output rate that necessitated an increase in the capacity at 224-T. In 1948, B cell was activated to operate in parallel with E cell.

In the mid 1950's, the bismuth phosphate process was abandoned for more efficient processes and the 224-T became excess to programmatic needs.

The 224-T is being maintained in a safe condition. The processing area, however, is near ambient pressure because there is no operating cell exhaust system. The doors are constructed of wood and over the years have warped and shrunk. The plutonium inventory, deteriorating condition of the physical barrier and low differential pressure between the cells and the outside environment resulted in a high radiological factor<sup>1</sup> being attributed to this facility by Owens and Sabin (1984). The radiological factor and the value of the facility for potential reuse give this project a high priority for decommissioning with respect to 200 Area SFMP facilities.

Access into the Hot Cell area of 224-T has been restricted since the gallery side of the building was renovated in the early 1970's. The 224-B and 224-T structures utilized the same design and process equipment. 224-B has been surveyed and a detail D&D plan with an estimated inventory has been completed. This data is contained in the document titled "Radiological Characterization of 224-B Hot Cells" (SD-DD-TRP-003) and forms the basis for estimating the work to be completed in 224-T.

### 1.2 OBJECTIVES

The objective of decommissioning the hot cell portion of the 224-T Building is to reduce or eliminate the radiological hazards of 224-T cell area and make approximately 15,000 ft<sup>2</sup> of the building available for beneficial reuse. Equipment and piping will be removed and the building surfaces decontaminated.

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<sup>1</sup>The radiological factor is a nondimensional factor used in making relative comparisons among the SFMP facilities.

This document describes the way that the decommissioning effort will be carried out and discusses the planning, the allocation of resources, the procedures and other documentation that must be prepared to support the effort, and the cost and schedule of the project.

### 1.3 SCOPE

The project will be limited to the following activities.

- Erection/construction of a staging building to serve as a packaging and shipping area for all contaminated equipment removed from the cell area.
- Isolation of the cell area from the rest of the 224-T Building. This includes disconnection from transfer lines, waste lines, and the 224-T Building ventilation system. The building ventilation supply and service piping will remain to the extent that it is not contaminated.
- Removal and packaging of all process equipment and piping.
- Decontamination of building surfaces.
- Repairs to the building will be made only to assist in the decommissioning and to make the building safe and secure at the end of the project. Repairs will not be made to make the building useful for any specific purpose. Systems (such as electrical and fire protection) will not be upgraded unless these systems are needed to leave the building in a safe standby condition.

## 2.0 FACILITY DESCRIPTION

### 2.1 224-T CELL AREA

#### 2.1.1 Main Structure

The 224-T Building is constructed of reinforced concrete and concrete block. The building is divided along its length by a 1-ft-thick concrete wall into two main sections. The southern section of the building is occupied by the processing cells.

#### 2.1.2 Processing Cells

What equipment and radiological characteristics exist in the 224-T cell area is not known. For estimating purposes, however, it is assumed in this report, that because of the similarity of the 224-T and 224-B Buildings, the radiological data contained in the 224-B report (SD-DD-TRP-003) can be used as a basis to evaluate D&D costs of the 224-T Building.

The processing portion of the building consists of six cells (A through F). Cells A through E are three stories high (40 ft) and are separated from each other by 15-ft high, 8-in. thick concrete walls. Each of these cells is approximately

25 by 28 ft. Cells A, B, D, and E are similar in equipment and configuration. On the first floor of each cell, there are two 9-ft diameter by 9-ft high tanks and one 4-ft, 6-in. diameter by 7-ft high tank. B cell has an additional tank with smaller dimensions. Some of the tanks are equipped with agitators and motors. A, B, D, and E cells also have a 10- by 12-ft operating deck at the second floor level. A 40-in. centrifuge was located on each of these operating decks. After the building was deactivated, the E cell centrifuge was removed from the operating deck and placed on the cell floor. A temporary plank and plywood deck has been built over E cell at 5 ft above the second floor level.

C cell differs from the other cells in structure and arrangement. Approximately one-half of the cell is a deep cell; the floor is 19 ft below the first floor level. Vessels in the deep cell include two 4-ft 6-in. diameter by 7-ft high tanks and one 9-ft diameter by 9-ft high tank. A 5-ft 6-in. by 11-ft high pipe tunnel extends 34 ft from the deep cell beneath the first floor offices to a pipe encasement. The piping in this tunnel and the encasement were used for transferring solutions between the 221-T Building (the separations facility) and the 224-T Building (the concentration facility). A single 9-ft diameter by 9-ft high tank sits on the first floor level of C cell.

There is a ground level personnel access door into each of the five cells from outside. Additionally, a 12- by 12-ft high equipment access door is located in the top portion of the outside wall of E cell.

The 50-ft 6-in. by 25 by 25-ft high F cell is separated from the other cells by a concrete wall; these concrete block walls will be removed during D&D cleanup, and only process and waste piping connect F cell with the others. One-quarter of F cell is a 12-ft 8-in. by 25-ft centrifuge deck that is elevated 7 ft above the remainder of the cell floor. F cell can be entered through doors from the loadout area and the outside.

There are two 26-in. centrifuges on the elevated operating deck. The first floor level has four vessels with dimensions of 4-ft diameter by 5-ft high. Additional equipment includes a small centrifuge (approximately 12-in. diameter) and two small vessels (approximately 1 ft 6 in. by 2 ft high). A scale and agitator motor have been placed in F cell for storage.

### 2.1.3 Bridge Crane

A manually operated, 8-ton bridge crane is installed over the cells. The rails run the length of A to E cells allowing access to each of them. The bridge crane will be used to move equipment into and out of the building. The crane is operated from a walkway that extends around the outside of the cells at the second floor level. A 6-ft high wall shields the walkway from the cells. The access doors to the walkway at both ends of the A to E cell pipe gallery have been sealed with concrete.

### 2.1.4 Service and Drain Piping

The service piping and aqueous make-up piping entered the building at the east end. The aqueous make-up chemicals (originating from 271-T), steam piping, entered the building through overhead lines. Sanitary water enters the building below grade at the northeast end of the 224-T.

Four sewer systems were used in the 224-T. In addition, there is an internal cell drainage system that collected drainage in a waste receiver tank in the deep portion of C cell.

A gutter along the east side of each of the A to E cells drains to a 6-in. clay pipe laid below the cell floors. There is also a floor drain in the corner of the A, B, D, and E cell operating decks that drains to the 6-in. line. The 6-in. drain line is sloped from each end of the cells toward C cell.

In C cell, the drain line empties into the C-9 tank (originally drained to the larger C-7 tank). Drainage from the deep portion of C cell collects in a sump where it can be jetted to C-7 tank. F cell and the loadout room drain to a sump. The sumps can be emptied by jetting the waste through a series of tanks until it is collected in C-8 tank.

An additional pipeline transfer line that is still intact to cell 35 of T-Plant. Since there are no direct connections from 224-T to tank farms, this line could be used for waste routing. Its usage will depend on a successful hydrostatic test of the line, the radionuclide content of the waste, and whether the transfer will interrupt T-Plant operations.

## 2.2 RADIOLOGICAL CHARACTERIZATION

A radiological characterization of 224-B was conducted in FY85 to support the decommissioning planning SD-DD-TRP-003 (Gould and Troyer, 1985). The 224-T D&D plan is based on the radiological characterization of the 224-B Building. The purpose of the characterization was to determine the radiological conditions that will be encountered during the D&D project and to establish a radiological inventory for the facility. A summary of the dose and exposure rates is presented in Table 1. Estimated inventories for the facility are shown in Table 2.

Table 1. Estimated Summary of 224-T Exposure/Dose Rates.

Cell	Cutie Pie Window Open (mrad/h)	Snoopy (mrem/h)	Reuter-Stokes Ion Chamber ( $\mu$ R/h) <sup>a</sup>
A	< 1	< 0.1	10.2 to 1.5
B	< 1	< 0.3	10.0 to 13.3
C (grade)	< 1	< 0.1	up to 20
C (pit)	3 <sup>b</sup>	< 0.1	< 50 to 60
D	< 1	< 0.1	15 to 18
E	< 1	< 0.1	up to 12.9
F	< 1	< 0.1	18 to 24

Table 2. Estimated Summary of 224-T Radiological Inventories.

Isotopic inventory (in Ci except as noted)					
Cell	$^{241}\text{Am}$	$^{239}\text{Pu}$	$^{137}\text{Cs}$	$^{90}\text{Sr}$	$^{60}\text{Co}$
A	5.9 E-02	7.7 E-01	1.6 E-02	3.6 E-02	6.0 E-03
B	8.8 E-02	1.2 E+00	8.2 E-03	6.0 E-03	3.0 E-03
C	2.0 E-01	2.6 E-00	2.7 E-01	1.9 E+01	3.6 E+00
D	3.5 E+00	8.6 E+00	1.0 E-02	1.2 E-01	1.5 E-02
E	6.7 E-02	8.8 E-01	4.4 E-02	5.4 E-02	6.0 E-03
F	1.3 E+00	1.7 E+01	6.6 E-01	1.3 E+00	<5 E-03
Loadout hood	6.8 E-04	8.9 E-03	1.9 E-08	-	-
Total	5.2 E+00	3.1 E+01 (505 g)	1.0 E+00	2.1 E+01	3.6 E+00
Air tunnel <sup>a</sup>	6.5 E-02	3.6 E+00 (58 g)	1.6 E-03	-	-
<sup>a</sup> The inventory reported for the air tunnel is only for the approximately 190 ft portion that will be removed in this project. This portion lies parallel to the south wall of 224-T.					

The radiological characterization determined the following items:

- The heavy coating of dust and the pigeon feces found in some of the cells are contaminated with americium as well as fission products.
- The highest concentrations in cell dust for all radionuclides except  $^{60}\text{Co}$  were found in F cell.
- The deep portion (pit) of C cell had the highest levels of  $^{60}\text{Co}$ . The walls of the pit have water marks, indicative of past flooding. Concrete chipped from the wall is contaminated.
- Many of the flanges were significantly more contaminated than other exterior surfaces surveyed.
- Each tank was viewed through a riser to determine its contents. With few exceptions, the tanks were empty. The C-9 tank had a dry, white crystalline substance approximately 4 to 6 in. deep on the bottom. A sample of this substance was surveyed with field instruments and found to be low activity (~1,500 d/m alpha, 600 cpm B-G). The E-4 tank has a small pool of oil covering about one-half of the tank bottom; the oil

showed only background radiation levels. The F cell tanks had a thin film that appeared to be dust or a layer remaining after liquid had evaporated.

- The gutters and sumps along the east walls of A through E cells and along the south wall of F cell had the highest radiation reading of the cell floor areas.

### 3.0 CRITERIA

This section presents criteria for worker radiological protection, waste handling, and facility condition at the end of the D&D project.

#### 3.1 RADIOLOGICAL PROTECTION

The following criteria shall be met during the decontamination of 224-T cell area:

- Worker doses shall be maintained ALARA and within the guidelines set forth in RHO (1983c) see Table 3.
- Radioactive contamination shall be controlled to keep exposure to the general public to the lowest practical levels not to exceed the limits of DOE Order 5480.1A, Chapter XI (DOE 1981).
- Worker radiological safety shall be protected by the use of administrative and physical controls and by performing work in accordance with the General Regulations and Practices for Radiation Work.

Table 3. Occupational Dose Guidelines (rem).

Type of exposure	Annual	Quarter	Week
Whole body, head and trunk, gonads, lens of eye, red bone marrow, blood-forming organs	3	1.25	.3
Skin (except hands and forearms)	9	3	.9 <sup>a</sup>
Other organs (except bone)	7.5	--	--
Bone	15	--	--
Forearms	15	5	--
Feet	15	5	1.5 <sup>b</sup>
Hands	15	5	1.5 <sup>c</sup>
<sup>a</sup> As measured by the "unfiltered" chip in the record TLD, and "unfiltered" supplementary TLD, or timekeeping with an open window CP. <sup>b</sup> As measured by a closed window CP and timekeeping or a supplemental TLD dosimeter. <sup>c</sup> As measured by a finger ring worn with the TLD chip directed toward the source, or an open window CP and timekeeping (RHO 1983c).			

### 3.2 WASTE HANDLING

Waste packaging, shipping, and disposal shall be in accordance with the following criteria.

- Waste shall be segregated for disposal according to contamination type and level.
- Solid waste packaging, shipping, and disposal shall be in accordance with WHC (WHC-EP-0063).
- TRU waste must be certified to meet WIPP waste acceptance criteria as detailed in Manning (1983).

### 3.3 RESIDUAL RADIOLOGICAL LIMITS

At the end of the decommissioning project, the building will meet the following radiological conditions.

- There shall be no smearable contamination; a low level of fixed contamination is permitted.
- The whole body dose rate to the maximally exposed individual shall be less than 1 mrem/hr.
- Any residual contamination, as a minimum, will be painted with a yellow coat of paint covered by a contrasting color of paint. The yellow paint will serve as an indication for future users of the possible presence of contamination.
- The average annual dose from residual contamination to any individual shall be less than 0.5 rem/yr to the whole body, gonads or bone marrow, and less than 1.5 rem/yr to any other organs.

### 3.4 FINAL PHYSICAL CONDITION OF CELL AREA

At the end of the decommissioning project, the building must meet the following criteria with respect to its physical condition and configuration.

- Any openings through floors shall be made safe from falling and tripping hazards.
- The building shall be secure from intrusion by animals and the elements and unwarranted intrusion by man.
- Any openings created through walls shall be closed in a permanent manner.
- Electrical wiring and service piping left in the building shall be terminated in a manner to allow the services to be safely returned to service.

- The building shall be isolated or sealed from any systems that have the potential of contaminating the building.
- Services required for routine personnel entry or to protect the facility from the weather shall be left intact and functioning.

#### 4.0 DECOMMISSIONING PLAN

##### 4.1 GENERAL

##### 4.1.1 Decommissioning Approach

The decommissioning of 224-T cell area will follow the following sequence:

- Gathering of facility and radiological information.
- Development of a detailed plan for executing all phases of the D&D effort.
- Preparing safety and environmental documentation.
- Construction/erection of a metal building in the vicinity of the 224-T Building to serve as a staging area for contaminated material being removed from the cells.
- Remove, package, and dispose of all contaminated piping and equipment.
- Decontaminate the building surfaces.

To complete the building decommissioning, the building will be refurbished to make it safe for occasional personnel entry. A more detailed discussion of the decommissioning steps is presented in Section 4.2

The planning and coordination of daily activities will be accomplished by an oversight team composed of representatives of the Program Office, Engineering, Radiological Engineering, Safety, D&D Operations and Production Control.

##### 4.1.2 Decommissioning Constraints

Decommissioning will be performed in the sequence discussed in Section 4.1.1. Since the building has been out of service for many years and no other facilities are included in this project, most of the constraints on the decommissioning sequence are internal to the building.

The following list enumerates configuration or sequential constraints that affect the decommissioning logic for 224-T cell area.

- Utilities must be isolated from the work area before any dismantling work begins. This is necessary for worker safety. All utilities that are left in an energized condition must be clearly marked with signs.

- Airlocks (greenhouse) and HEPA filters must be installed in the exhausts prior to significant work in the cells. These are provided to ensure no environmental releases of radioactivity occur.
- The A through E cell work must be essentially complete prior to starting work in F cell. This constraint is caused by the necessity to ventilate the cells and the limited number of portable exhausters available. Conversely, F cell could be completed before the A through E cells.
- Piping should be removed from the second floor gallery prior to dismantling the third floor gallery. This allows better access and clearances for removing through-the-floor scales and tanks that are mainly on the third floor.
- The C-7 tank will be the last tank removed from the A through E cells. This tank should be left in place and connected to the cell floor drainage system. If there is a need to wash cells or tanks, the water can be collected in this tank.

#### **4.1.3 Material Accounting**

Equipment and nuclear material (Six 1983) removed from the facility during this project will be reported to the appropriate accounting organization. The equipment list will be reported by D&D to the Property Management Department by a Property Disposal Request or a Property Transfer. The residual nuclear materials that are disposed with equipment, or cleaned from the facility surfaces will be recorded on waste disposal forms. This information will also be reported to the Nuclear Materials Control Department for accountability purposes.

### **4.2 PROJECT IMPLEMENTATION PLAN**

#### **4.2.1 Project Planning**

This effort includes the front-end review and analysis of the facility, the method for decommissioning and the impacts of the decommissioning.

**4.2.1.1 Project Plan.** This task involves the review of the facility and its equipment, collection of radiological data, and presentation of a plan for completing the decommissioning project. This project plan is the result of this effort.

**4.2.1.2 Prepare Environmental Documentation.** Environmental documentation, in the form of an action description memorandum and environmental evaluation, will be prepared in compliance with the NEPA. It is anticipated that no further environmental documentation will be required to complete this project.

**4.2.1.3 Prepare Safety Analysis Report.** The project, as described in the project plan, will be reviewed with respect to the possibility and consequences of accidents. The resulting report may identify areas requiring physical or administrative controls to reduce the possibility or consequences of an accident.

- 4.2.1.4 Perform Readiness Review.** The readiness review is an appraisal of the thoroughness of preparation for the D&D project. The review board, comprised of senior personnel familiar with safety and environmental requirements, examine the documentation to be used, equipment available, and qualifications of the personnel performing the work. Recommendation to commence work is made when the readiness review action items have been completed and approved.

**4.2.2 Mobilization and Building Preparation**

This work package includes the activities that are necessary to provide quarters for the D&D workers and to prepare the 224-T for the D&D work to follow.

- 4.2.2.1 Install Cell Ventilation System.** The cell ventilation was originally supplied by fans exhausting through the cell roof directly to atmosphere. This system has been shut down while the facility is in protective storage.

A HEPA-filtered exhaust system will be installed to provide a nominal -0.25-in. water differential pressure in the cells with respect to outside.

The cell exhaust system will be designed to use the exterior doors as the exhaust air intakes. It will be possible to switch the intakes to different cells to maximize the air flow in the area where work is being performed. Since it is apparent that F cell air space is separate from the A through E cell air space, the exhaust system will be designed to ventilate each of these cells at separate times. This creates the condition that all of the decontamination on one of these air spaces must be complete prior to starting in the other.

In addition to providing a HEPA-filtered exhaust for ventilation control, measures will be taken to reduce the air infiltration into the cells.

- 4.2.2.2 Personnel Necessities.** This task will provide the facilities and equipment that will be necessary for the D&D workers to work in the building. The D&D workers will have most of their facilities, such as showers and lunchrooms, in another location. Men's and women's changerooms will be provided in the 224-T Hot Cell portion of the building. These changerooms will have lockers, shelving for work clothes, and regulated and nonregulated laundry hampers.

Additional necessities include safety and life protection equipment. Emergency lighting, fire extinguishers, and radiation area monitors will be provided in all work areas.

- 4.2.2.3 Establish Airlocks on Cells.** In order to maintain contamination control during the work in the cells, airlocks will be provided on entrances into the cells from outdoors or from the clean side of the building. An airlock will be provided on B cell door for access to A, B, and C cells (see Section 4.2.2.5 for doorways between cells). The same type of airlock will be provided for D cell to service D and E cells. These airlocks will be used for personnel access and removing small items from the facility.

The large equipment doors on E cell will have to be opened for removing large burial boxes and tanks from the facility. An airlock for these doors will be provided by extending the wall that separates D and E cells to the ceiling. Large doors will be provided in this wall to permit the movement of large pieces of equipment into E cell from the other cells. In this manner, E cell will be used as an airlock. As an alternative, a free-standing greenhouse large enough to handle vessels could be installed on the inside or outside of the equipment doors.

- 4.2.2.4 Housekeeping in Cells.** During the radiological characterization of the 224-B Building, the dust and pigeon feces that have accumulated in the cells were found to be contaminated. It is assumed that these conditions will be found in 224-T. However, no radiological characterization has been completed to date on 224-T. Initial cleanup will be done using decontamination techniques and tools, which include shovels, scrapers, sweeping compounds and brooms, and HEPA-filtered vacuum cleaners.

The initial cleaning may be followed by a wash down of the cells. The wash water will flow to a tank in C cell through the floor drains. The water will be transferred to tank farms through an existing line, a temporary line, or in a tank truck.

- 4.2.2.5 Building Modification.** The building will be modified to facilitate the decommissioning effort. The modifications will aid in the ventilation and contamination control as well as worker safety. In addition to the 224-T modifications, a 60- by 250- by 36-ft high metal support and staging building will be constructed on the east side and connected to the cell side of 224-T. This metal support building will be utilized to package, store, sort, and decontaminate the pipe equipment and other contaminated materials currently contained in the Hot Cell area of 224-T (see Sketch 224-T-CS-003, Appendix A.)

Some of the cell doors will be covered with plastic to reduce the amount of air infiltrating into the cells and thereby reduce the ventilation capacity needed. The doors that are not covered with plastic will be provided with a secondary containment to act as an airlock. Holes will be cut through the concrete walls dividing the cells (A through E) to allow personnel access to all of the cells while minimizing the number of entrances into the cells. A, B, and C cells will be serviced by one airlock and joined by doorways cut through the walls. The deep portion of C cell makes it necessary to leave D and E cells separate from the others. Most of the piping along the walls is above the 7 ft level, so the doorways will be cut with a minimum of interference. If it is necessary to remove a pipe to provide the doorway, the method described in Section 4.2.4.2 will be employed.

Since E cell will be used as an airlock, the doorway cut through the concrete wall between D and E cells will be covered with plastic to control airflow. A slit in the plastic to allow workers to pass through will be provided with a resealable fastener.

The floor drains from the A to E cells drain to the C-9 tank in the deep half of C cell. The drain line will be connected to the larger capacity C-7 tank to reduce

the number of times the tank needs to be drained if the floors and walls are washed. Since this tank will receive cell drainage, it will be the last one removed from the cells. A method for monitoring the liquid level will be included.

- 4.2.2.6 Prepare Crane for Services.** A bridge crane, which is mounted along the length of the A through E cells, and smaller monorail cranes will be used for removing tanks, burial boxes, etc., during the dismantling phase. The cranes will be subjected to a third-party inspection prior to use in this project. Following inspection and load testing, the cranes will be repaired to correct the identified deficiencies and lubricated.

In addition to other work using the crane, some I-beam rollers may be attached to the crane or rails to allow the attachment of suspended scaffolding, which can be easily moved from cell to cell. The cranes and rails will also be load tested.

- 4.2.2.7 Provide D&D Utilities.** Temporary utilities will be provided to parts of the 224-T cell area.

#### **4.2.3 Gallery Dismantling**

This work package was identified in the 224-B D&D and was completed in 1970. It is not included in the 224-T D&D plan.

#### **4.2.4 A Through E Cells Dismantling and Decontamination**

This work package will result in the removal of essentially all of the equipment, piping, tubing and conduit, and most of the radioactivity in A through E cells.

There are two constraints controlling the order of work in these cells. The ventilation exhaust system is being connected to the same set of doors that are used for personnel access to the cells. As a result, the cells being worked in must be coordinated to ensure personnel access. It will not be possible to work in D and E cells simultaneously since one door will be needed as an entrance.

The D&D work in these cells will be performed by D&D workers with the exception of the work on the centrifuges. The centrifuges that have been identified as reusable equipment will be removed and decontaminated by other crafts.

- 4.2.4.1 Remove Centrifuges.** The centrifuges will be removed and decontaminated by crafts other than the D&D workers. To avoid any interference with D&D activities, the centrifuges will be removed before D&D work begins in the cells. Crafts personnel will disconnect the centrifuges from the piping, electrical, and instrument lines and release it from its mounting. Operators will decontaminate the exteriors of the centrifuges. The centrifuges will then be moved to the airlock.

In the airlock, the centrifuges will be further decontaminated and packaged for removal from the facility.

**4.2.4.2 Isolate Cells.** The tasks in this activity are intended to isolate the cells so work can proceed in any of them without impacting or being impacted by work in other cells or other parts of the building. The transfer piping between cells passes through openings in the cell dividing walls. The piping will be cut at the point it passes from one cell to the next. The pipelines will be coded according to type of service. Personnel protective clothing requirements will be dictated by the type of service the pipe was used for. The degree of contamination control required for cutting the pipes will be determined by drilling and swabbing the inside of the pipes and checking for the presence of radioactivity or liquids. It is expected that most lines will be dry due to the apparent care taken in flushing equipment when the facility was vacated and the elapsed time that has allowed for evaporation. The pipe will then be cut using tools such as hydraulic crimper/cutters, portable band saws, reciprocating saws or pipe cutters. If contamination is present, the cut area may be injected with foam that serves as a fixative or contained in a glovebox.

Conduit that provides power to the cell lighting will remain intact. All lines that remain energized will be marked with signs to prevent accidental cutting. All other conduit will be checked by an electrician before it is cut. After the cells are isolated, the checks by the electrician will not be required.

**4.2.4.3 Dismantle Piping.** The piping within the cells will be removed using the same sequence discussed in the previous section for isolating the cells. All pipelines will be identified as to past use. The piping will be drilled and swabbed to determine whether any liquids are present and to what extent the interior is contaminated. The piping will then be cut into lengths that can be safely handled by D&D workers working from ladders, portable scaffolding.

Piping will be segregated (based on past use). The process water and chemical feed piping will be disposed as low-level waste (based on a survey using field survey instruments). Process and waste piping, steam piping, instrument tubing, in addition to any feed piping with high alpha contamination, will be selectively assayed to determine its TRU status.

Piping classified as TRU will be packaged for shipment to an onsite storage facility. Low-level waste piping will be packaged for onsite disposal. The tanks in the facility may be used for low-level waste disposal. Piping assayed as exceeding 100 nCi of TRU contamination per gram of waste will be packaged as TRU waste.

**4.2.4.4 Remove Equipment for Disposal.** This activity will result in the removal of all equipment from the cells.

The tanks in the A through E cells can be used as burial container for some of the piping that is removed. In addition, one of the tanks (D-3), is currently a suspected TRU waste form. A portable exhauster, capable of providing a containing airflow into the tanks, will be connected at one of the flanged risers of each tank that is to be opened. The exhaust will be directed to the building exhauster intake.

At this point, a verifying assay of the tank interior will be made to confirm the non-TRU status that has been assigned the tanks (except D-3), based on the radiological characterization. If necessary, the tank interior will be decontaminated to reduce TRU contaminants and make the tank non-TRU waste.

With the exhauster connected to the tank, pipe will be loaded into the tank through the center opening. A structural analysis of the tanks (see Appendix F) establishes the loadbearing capacities of the tanks.

After a tank is filled, it will be disconnected from the portable exhauster and closed. Blind flanges will be bolted in place over the risers and the center opening.

The following activities apply to the tanks and the other equipment located in the cells (radiation detectors, lead shields, metal ventilation ducting, and sampler basins). The equipment will be loosened from its retaining mounts and subjected to exterior decontamination, if necessary. After being decontaminated, the equipment will be moved into an airlock where it will be surveyed and further decontaminated or packaged or both, to make it acceptable for transport and disposal. The waste packages will be outloaded from the airlock and transported to the low-level waste burial ground for disposal. After all the in-cell equipment and hardware has been removed from the cells, the concrete block walls that form the cells will be removed.

- 4.2.4.5 Decontaminate Cells.** The final activity in this work package is the removal of smearable contamination and higher dose fixed contamination in the cells. The selected decontamination technique will correspond to the difficulty of contaminant removal. The gutters are more contaminated than the remainder of the cells and will probably require the removal of some of the concrete for decontamination. Concrete will be removed using chipping hammers, scrabblers, or a high-pressure water spray. The walls, being less contaminated, will be decontaminated by high-pressure spraying, washing, and wiping. The crane and lights will be decontaminated to the extent that it is practicable or removed.

An RPT will survey the building surfaces for direct radiation and will survey smears to determine whether additional decontamination is required.

Once the surfaces are decontaminated, the pipe bundles to the gallery and any pipes penetrating the cell walls will be removed. This will be done with chipping hammers, concrete saws, or core drills. Penetrating pipes will be removed at the wall separating E and F cell. Since F cell will still be contaminated and without exhaust ventilation, these activities will take place in a greenhouse.

Openings made in the wall will be temporarily covered until the final stages of work in the building. At that time, the holes will be grouted closed.

The C-7 tank that was left in the deep portion of C cell will be removed after it is determined that no more water will be generated in the building. At that time, any waste water will be sampled and transferred to tank farms. The pit and the tunnel will also be decontaminated. A concrete cap will be placed over the floor of the deep portion of C cell if it cannot be easily decontaminated.

The wooden doors in the cells will be removed and replaced rather than decontaminated. Door replacement, as well as other refurbishment work, is included in the closeout activities of the project, but may begin at this time.

#### **4.2.5 F Cell Dismantling and Decontamination**

The activities in this work package will result in the removal of essentially all of the piping, tubing and equipment, and most of the radioactivity in the F cell end of the building. This includes the F cell property and loadout area.

##### **4.2.5.1 Establish Contamination Control.** The first task will be to establish the physical means for providing contamination control during the dismantling and decontamination in F cell.

The HEPA-filtered exhaust system connected to the A through E cell doors will be connected to the F Cell. In addition to connecting the exhaust system, the cracks and opening into the cell area will be sealed to minimize air infiltration.

A large airlock will be constructed on the outside of the wall that separates the cell from the D&D staging building on the northeast end.

##### **4.2.5.2 Dismantle Piping.** Pipe removal in F cell will follow the same sequence as the A through E cell pipe removal. The piping will be removed from the tanks and the risers covered with plastic or blind flanges. The pipelines will be identified as to past use and marked to indicate order of removal. Each pipeline will be drilled and swabbed to determine the contamination control measures to be used when cutting. As the pipe is removed, it will be separated based on its contamination potential. The pipes with a high-contamination potential will be assayed to determine disposal status.

##### **4.2.5.3. Remove Equipment.** The equipment to be removed from the F cell consists of centrifuges, tanks, agitators, sample boxes, and a scale. The agitators can be removed from the tanks and replaced with blank covers. The tanks will be flushed to remove contaminants until assayed and determined to be non-TRU. This will require attaching a portable exhauster, spraying the inside (using an omni-directional spray head), and recovering the decontamination solution.

Following the tank decontamination, piping that is assayed as non-TRU may be deposited in the tanks, if this is deemed an efficient use of time. The smaller size of these tanks (4 by 4 ft), make the tanks less valuable as burial containers. The tanks will be closed and the exteriors decontaminated. After the tanks are moved into the airlock, the tanks will be surveyed and further decontaminated, or sprayed with a fixative, if necessary.

Other equipment will be decontaminated or packaged for disposal or both. The two centrifuges will be assayed to verify the TRU content. The centrifuges will be packaged and disposed in a manner dictated by the contamination level.

- 4.2.5.4 Dismantle Loadout Hood.** The F-10 tank and loadout hood are currently separated from the loadout area by a wood frame and plywood wall. The wall will be removed and replaced with a larger containment that will allow movement around the enclosure. The containment structure will be ventilated by a HEPA-filtered exhauster. The vessel vent connection for this hood is downstream of the isolation point; consequently, a pipefitter will have to disconnect the vent piping before D&D workers can begin. The HEPA-filtered exhauster can be connected to this pipe to provide airflow into the hood.

The hood is constructed of a metal frame with glass panels. As it is dismantled, the parts will be decontaminated to non-TRU levels if necessary and packaged for low-level waste disposal. The F-10 tank and its feed piping will be removed and disposed as TRU waste. The drip pan and the scale hardware associated with the tank will be decontaminated and disposed of as non-TRU waste.

- 4.2.5.5 Decontaminate F Cell Area.** F cell and the loadout area building surfaces will be decontaminated after removal of all the piping and equipment. Because of the containments used, the contamination should be restricted to the cell and the area immediately around the loadout hood. The method of decontamination will depend on the type of contamination found in specific areas. The walls and ceiling are the least contaminated and can be cleaned by washing and wiping. The floors, and in particular, the gutter and sumps, are more contaminated and may require the removal of part of the concrete to decontaminate. The decontamination will be coordinated with direct and smear surveys to ensure acceptable radiation levels for a controlled facility.

After decontamination has removed the potential for a contamination spread, the greenhouse and airlock will be removed. These will be disposed of as low-level waste. In addition, the wooden doors in F cell will be removed, disposed of, and replaced. Repairs to the building will be included in the project closeout activity.

#### **4.2.6 Yard Piping Decommissioning - Establish Contamination Control**

The first tasks of this activity will be to establish the contamination control necessary to cut the contaminated piping. A moveable containment will be designed and constructed. The containment will be equipped with a connector, which will be used for an exhauster, to keep the containment at a negative pressure.

- 4.2.6.3 Isolate Cell Waste Lines.** There are 11 waste lines exiting the cells that will be left in an isolated condition. Ten of these are tank-jacket cooling water drains that are not expected to be contaminated.

The lines will be exposed by excavating along the south wall of the building. After the line is exposed, the pipe will be drilled and swabbed to determine whether it is contaminated. If contamination is detected, a containment will be

placed over the pipe during the isolation. A section of pipe will be cut out of each of these and a plug or blank placed over each end.

After all of these activities are completed, the area will be returned to near original condition. Backfill will be brought in to fill the excavations to grade, and the roadway will be surfaced with rock and gravel.

#### **4.2.7 Project Closeout**

These activities include the physical refurbishment required to leave the building in a safe condition and the documentation to confirm and report the D&D activities that were performed.

**4.2.7.1 Confirm Radiological Condition.** The final radiological condition of the facility must be determined and documented to demonstrate compliance with the criteria for a controlled facility. An RPT will work closely with the D&D workers during the decontamination phase of the project. The RPT will record the results of a final survey and mark those areas containing residual (fixed) contamination. These areas will be painted in accordance with established practices (see Section 3.0). In addition, instrumentation capable of detecting extremely low exposure rates will be brought into each cell to verify that the exposure criterion is met.

**4.2.7.2 Repair Facility.** During the D&D activities, holes were created through both inside and outside walls to remove piping. In addition, the sumps and gutters may have been chipped to remove embedded contamination. These openings and surfaces will be refinished with concrete. The concrete may also serve to shield some of the fixed contamination that remains in the concrete.

The supply ducting between the gallery side and cells will be left open to allow the building supply system to heat and ventilate the cells. A grating will be placed over each of the openings in the pipe gallery. The roof openings will be fitted with rain caps and screen (following decontamination) to allow ventilation, but to prevent bird intrusion.

The wooden doors leading to the cells will be replaced with exterior-quality lockable doors.

**4.2.7.3 Return Facility to Normal Services.** Portions of the facility services were terminated when the D&D activities began. This task will make any repairs necessary and return the facility services to active service. An electrician will check to ensure that all electrical lines have been terminated. Unterminated lines will be terminated in a safe manner, and the circuits remaining in the building will be energized. A pipe fitter will place blind flanges on any of the pipelines that were left in the building. The services can be returned to the entire building, after these items have been secured.

The temporary services that were established to support the D&D work will be removed after the other utilities are returned to service.

- 4.2.7.4 Prepare Documentation.** The final project activity is the documentation of the effects of the D&D work. The actions taken, and the results and lessons learned from the project, will be presented in a closeout report. Additional documentation is necessary to maintain configuration control in the drawing files. The drawings, which apply to other similar facilities, will be annotated to indicate the final condition of the building.

The final documentation needed at the facility is radiological posting. The doors into the cells will be posted with controlled facility signs indicating that the disturbance of any of the building surfaces requires radiological monitoring. Postings will also indicate the presence of underground radioactivity in the area of the air tunnel that remains.

## 5.0 SAFETY

This section identifies known or possible conditions that require specific attention for the job to proceed safely. The measures that will be employed to ameliorate the unsafe conditions during the D&D operation are briefly discussed.

### 5.1 RADIOLOGICAL SAFETY

All of the D&D work in the cells and some of the work in the galleries, will have a radiological hazard associated with it. A combination of physical and administrative controls will be used to control the radiation hazards.

#### 5.1.1 Containment

The containment of the radioactivity in the cells, tanks and pipeline has been discussed in Section 4.2. To summarize, HEPA-filtered exhausters will be connected to the building and tanks to maintain airflow into rather than out of contaminated areas. Airlocks will be used at doors that will be used to move personnel or equipment in and out of the building.

Additional methods of containing radioactivity are decontamination, fixing, and wrapping in plastic. These methods will be used to prevent contamination spread as equipment and burial boxes are removed from the building. To improve the differential pressure between the cells and outside, areas suspected of leaking air will be caulked, taped closed, or otherwise sealed.

#### 5.1.2 Criticality Controls

An estimate of the  $^{239}\text{Pu}$  inventory was made from data gathered during the radiological characterization of the 224-B Facility; this is being used as the basis for 224-T decommissioning activities. The gamma fluxes from  $^{137}\text{Cs}$  and  $^{241}\text{Am}$  were measured in facility dust and in tanks, then extrapolated to provide an estimate for gamma flux in pipes and the rest of the facility. A ratio of  $^{241}\text{Am}$  to  $^{239}\text{Pu}$  was developed from dust samples and scraping from flanges and pipes. This data was then used to estimate an inventory of 505 g of plutonium in 224-T. This inventory and subsequent estimates will be evaluated to determine if criticality controls will be necessary in the facility.

The controls, as presented in criticality prevention specifications, will primarily address the control of geometries, the reduction of reflectors and moderators, and the use of poisons. For example, when pipelines that may contain liquids are being breached, a critically safe catch bag may be used. It may be necessary to delay the use of water washes in the cells until there is a certainty that the fissile material inventory has been reduced to a safe level. Rings may be placed in the C-7 catch tank to prevent wash waters and fissile contaminants that collect in the tank from becoming a criticality problem.

### 5.1.3 Personnel Protection

Methods and dress requirements for working in radioactive or potentially radioactive environments will be established to protect personnel from exposure and contamination. The radiological survey indicates that exposure will not be a significant problem in this facility. The measured radiation levels were generally less than 1 mrad/h for beta-gamma radiation and less than 0.1 mrem/h for neutron. The exception is the deep portion of C cell, where beta-gamma radiation is about 3 mrad/h and some of the piping is 20 mrad/h at contact. These levels are not high enough to necessitate stringent protective measures, but work time in these areas will be kept at a minimum. Additional dosimetry (pencil dosimeters and finger rings) will be worn by workers to monitor and maintain their exposure below the prescribed levels.

Normally, two pairs of anticontamination clothing and a respirator will be worn in the cells. When initially breaking pipes in the galleries, additional protection will be provided through the wearing of an acid or water repellent suit. The RPT that follows the job may invoke more or less stringent controls depending on the radiation environment encountered. The radioactive environment will be monitored using portable, hand-held instruments and by continuous alpha air monitors located near the work areas.

## 5.2 INDUSTRIAL SAFETY

This D&D project will pose industrial safety hazards similar to those encountered on a construction site. There are additional hazards associated with chemicals and hazardous materials used in the process or equipment.

Tasks that are identified as presenting a high-risk potential will have a JSA conducted. Hazards will be identified in procedures, prejob safety plans, hazardous work permits, or in the specific JSA. The JSA is prepared by the D&D Operations manager and is reviewed and approved by the responsible safety engineer.

As mentioned in Section 4.2, crafts will be used to isolate systems that D&D workers will be dismantling. This is necessary to prevent the possibility of electrical shock or other hazards that would result from cutting into an active system. Any systems left in an energized state during D&D activities will be appropriately tagged to prevent disturbance.

Fire prevention will be practiced during D&D by minimizing the amount of flammable material brought into the building. Any construction materials used during D&D will be fire resistant or fire retardant. The fire-resistant or fire-retardant quality will be maintained by following the manufacturer's recommendations. Portable fire extinguishers will be available in the work area.

There are also industrial hygiene hazards associated with this project. Since 224-T was a chemical processing facility, there is a potential for residual chemicals in the pipelines. This is considered unlikely from facility inspections, but the possibility will be considered when breaking lines. Pipelines will be checked on both sides of valves for liquid content prior to cutting. A list of the chemicals that were used in the 224-T concentration process are listed in Appendix B.

Additional industrial hygiene hazards are present or potentially present in the galleries. These levels are probably residue from previously broken panelboard instruments. The panelboards also contain oil in the air filters, which may contain PCB. As deemed appropriate by an industrial hygienist, the area will be posted and workers will wear protective clothing while disassembling the panelboards and cleaning the galleries.

Asbestos lagging will have to be removed from some of the piping before it can be cut. An established procedure will be followed while removing the asbestos. Access will be restricted to the area where asbestos is being removed. Workers in the area will wear disposable coveralls and a full-face respirator and use wet techniques while cutting to minimize dispersal. The workers will also shower before lunch and at the end of the day.

### 5.3 SAFETY DOCUMENTATION

Prior to starting D&D work in 224-T, environmental documentation and a safety analysis report will be prepared. These activities are discussed in Section 4.2.1.

Additional safety documentation is prepared, such as JSA, criticality safety analysis reports, criticality prevention specifications, and review comment records. The review comment record is a formal method for representatives of the various safety disciplines to transmit comments on design media and procedures. Signoff of the design media or procedures follows resolution of the safety comments.

## 6.0 QUALITY ASSURANCE

Quality assurance associated with the D&D of 224-T will have two purposes: provide assurance that specified products and services meet necessary standards, and provide analytical and assay services.

### 6.1 QUALITY ASSURANCE PROGRAM

The quality assurance program for the 224-T D&D project will be based upon ANSI/ASME Standard NQA-1 (ASME 1983) as endorsed by RL 5700.1A (RL 1983). Policies and procedures that define the proper response to quality and safety aspects of ANSI/ASME Standard NQA-1 are outlined in existing WHC documents. These documents will be specified in the safety analysis report. The applicable quality assurance requirements will be imposed by project management with functional management concurrence.

Quality assurance reviews and inspections will primarily include personnel training, design support, inspection and procurement where these areas have a safety impact. Personnel training records will be reviewed to ensure that personnel working on the project have adequate training for performing their jobs. Design documents will be reviewed by a quality engineer who will prepare a verification or inspection plan if it is needed. A quality control inspector will perform the field inspections required by the inspection plan. Procurement quality assurance will monitor suppliers to ensure that the proper quality and safety standards are met and will provide quality verification of purchased products.

### 6.2 RADIOLOGICAL MEASUREMENTS

Services of the Analytical Laboratories Department will be used in establishing levels and inventories of radionuclides in certain waste products. Nondestructive assay techniques will be used in determining the levels of TRU activity in piping and equipment. Wet chemistry and radioactivity counting will be employed to determine the disposal mode of liquid waste collected in the facility.

All radiation measurement instruments, including hand-held field instruments, will be calibrated to a recognized national standard.

## 7.0 WASTE HANDLING

The dismantling of equipment and piping and the decontamination of building surfaces will result in solid and liquid waste, as well as TRU and non-TRU and noncontaminated waste. The estimated volumes of each of these waste types is presented in Table 4.

Table 4. Estimated Waste Volumes from 224-T Decommissioning.

Waste	Solid (ft <sup>2</sup> )	Liquid (gal)
TRU	2,700	Not applicable
Non-TRU	22,000	30,000
Noncontaminated	600	Not applicable

Solid waste will consist of the equipment and materials removed from the building and the materials used (plastic, wipes) to contain or clean contaminants. Material removed from the pipe and operating galleries will be radiologically surveyed to determine its status. Any frame wood walls are expected to be noncontaminated and will be disposed in the central landfill. The rest of the equipment will be disposed of as low-level waste, unless it is found to be TRU. Hazardous materials such as PCB, mercury or asbestos will be disposed in accordance with existing regulations at the time of removal.

The tanks in the cells are known to be contaminated and a significant effort will be made to decontaminate the tanks, as necessary, to non-TRU levels (less than 100 nCi/g of matrix). These tanks will be filled to a given weight limit (see Appendix F) with non-TRU piping removed from the cells, closed with blind flanges and used as shipping and burial containers. Use of the tanks as shipping containers will require the preparation of a safety analysis report for packaging. The pipelines will be nondestructively assayed using a sodium iodide system and techniques established at the plants on site. Pipelines will be sectioned and a series of measurements made with particular attention paid to suspected regions of radio-contaminant accumulation (e.g., low points, corners). If a pipeline is determined to be TRU waste, it will be packaged for TRU storage instead of being disposed in the tanks.

Solid waste determined to be TRU will be packaged in containers and certified for storage at WIPP. Pipes will be packaged in TRU burial boxes that can handle longer sections of pipe, thereby minimizing the number of cuts necessary for dismantlement. Wipes used for decontamination, contaminated clothing and miscellaneous small waste items will be packaged in the less expensive TRU waste drums.

Liquid waste will be generated from tank as well as general facility decontamination. Any of the liquid waste that exceeds radioisotope limits for ground disposal (per DOE 1981) or has chemical characteristics making it unsuitable for discharge to the environment will be transferred to tank farms. The waste will be sampled from a collection tank in C cell and analyzed for TRU content.

Some of the later washes in the cells may be low enough in radioactivity to be discharged to an existing liquid disposal site. This waste will be routed to the chemical sewer manhole on the north side of 224-T.

The amount of TRU material routed through B Plant will be controlled to prevent the criticality status of the facility from being affected. If it appears that the liquid waste has excessive concentrations of TRU material, it will be transferred to the tank farms in a tank truck.

## 8.0 COST AND SCHEDULE

The decontamination of 224-T cell area is estimated to cost approximately \$9.9 million (see Appendix H).

The costs do not include funds for an exhaustor for cell ventilation. It is expected that a portable exhaustor will be obtained using capital funds for the ventilation system. Another cost not included in the project is a safety engineer. The safety engineer will monitor D&D work and will be funded from company overhead.

Yearly costs and funding requirements are shown on the budget authorized/budget outlay schedule in Appendix H.

A schedule has been developed (see Appendix J) which shows that the D&D effort can commence in FY95 and be completed by FY98.

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I

## APPENDIX F

### Conversion of Hot Cell Area to Storage Area, Phase III

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## 1.0 SUMMARY

On completion of D&D activities described in Appendix E, the Hot Cell area of the 224-T will be converted to a drum storage area. This converted area, together with the metal staging building constructed for D&D activities, will provide storage for approximately 11,000 additional drums of TRU waste.

As part of the D&D process, the concrete block walls that form the cells will be removed. This will provide a large open bay area. This area, however, will be without lighting, fire protection, HVAC, or other facility services. These services will be installed as part of the project designed to convert this area into a storage area. The electrical, piping, and other support systems will be connected to the 224-T utility services to comply with the Uniform Building Codes and the National Electrical Code.

A seven-level stacking structure will be constructed in the bay area. The utilization of the existing structure will provide a shielded storage area for the high activity solid TRU waste materials that will require permitted storage after the year 2001. The total storage capacity of the decontaminated cell area is estimated to be 3,000 drums. The D&D staging building will provide storage for an additional 7,000 drums and with the present 2,000-drum storage capacity of the gallery section, the total capacity of the 224-T Building and D&D support structure will be 12,000 drums.

Stacking and retrieval of the drums will be accomplished by an automated drum stacker/retriever storage system, which will also be capable of providing remote inspection and automated inventory control system. The automated stacker retriever equipment will reduce labor requirements and reduce worker exposure during drum storage/retrieval and drum inspection.

The ability to reuse these structures after they are cleaned up will not only save the cost of building a new structure to store these drums, it reduces the time from a schedule standpoint that would be required to design and construct new structures.

## 2.0 DESCRIPTION OF CONVERSION OF HOT CELL AREA TO STORAGE AREA

On completion of D&D activities the Hot Cell area will be turned over without any utilities or support systems. These utilities will be installed as part of this phase of the project. A detailed description of these upgrades is given in the following sections.

### 2.1 FACILITY UPGRADES

#### 2.1.1 Structural

No structural changes will be made to the main structure of this portion of the building. Four of the six existing doors, however, will be blocked with concrete blocks. The sixth door will be upgraded to serve as the entrance for the drums into this portion of the facility. The upgrade will consist of the following:

- Replace the present wooden door with a metal, fire-rated door.

- Construct an airlock outside this door for controlling the HVAC zone integrity of the cell area during drum import into the facility. This airlock will be constructed of masonry block and will measure 15 ft long by 8 ft wide by 10 ft high. It will be equipped with double doors at each end.

#### 2.1.2 Electrical

The new electrical system of the cell area of the building is shown in the one-line diagram in Sketches 224-T-ES-001 and 224-T-ES-002 in Appendix A. The main features and components of this system are as follows:

- The main power center for this facility will consist of a 1,000 A, 480Y/277 Vac switch gear assembly. Power to this center will be provided from the main switch gear assembly in the gallery portion of the building.
- A 600 A, 480Y/277 Vac motor control center will distribute power to the HVAC air supply and exhaust fans, the hoist and lower voltage power distribution and lighting panelboards.
- Electrical lighting and service receptacles will be provided throughout the facility.
- All wiring will be new and installed in galvanized, surface-mounted conduit.

#### 2.1.3 Heating, Ventilating, and Air Conditioning

The hot cell side of the facility will be reconnected to the existing HVAC and HEPA filter systems of the gallery side of the building.

No HVAC or HEPA filter system will be provided in the D&D staging building. This decision is consistent with W-113 storage criteria requirements.

#### 2.1.4 Automated Stacker/Retriever

Automated storage is accomplished by the use of a rail mounted automated stacker/retriever system and high bay racks. The racks will be mounted in the cell area and the adjoining metal support building and will have aisles that allow the stacker/retriever crane to traverse through the racks to store the waste drums. The stacker/retriever crane will have a 4,000 lb life capacity and will be equipped with a bar code scanner for inventory tracking, and lighting equipment to support the camcorder remote inspection equipment required for the weekly inspection of the waste drums.

The automated stacker/retriever system is controlled by a computer to provide remote operations. The software controlling the system provides the ability to randomly access drums. Inventory tracking and inspection is computer controlled with manual over ride provisions.

The drums will be inspected weekly by an automated camcorder camera system that will provide an inspection equivalent to the requirements specified in WAC 173-303-630. The stacker/retriever crane moves into position and the camera equipment scans the drums. The images can be viewed manually in real time or recorded for inspection at a later date during normal working hours. The drum inspection is automated and capable of off-shift operations.

A dedicated maintenance bay for the stacker/retriever system will be located in the rear of the metal building adjacent to the hot cell side of the 224-T will be accessible to the transfer car. This maintenance bay will be physically separated from the main storage area of the building by walls and doors to provide for ALARA considerations. One of the two will be worked on at a time. System maintenance will be performed during the facility single-shift operating hours (8 hr/d, 5 d/wk).

### 3.0 PERMITTING OF NEW STORAGE FACILITY

Phase I permitting requirements for "Facility Upgrades" will not be affected. These upgrades involve replacing the existing aging building services to comply with current codes and established building maintenance standards required for the continued operation of the TRUSAF for an additional 30 years. These building service upgrades will not affect the current operating permits governing the ongoing 224-T operations.

Phase II permitting requirements for "Hot Cell Decommissioning" involves the removal and disposal of the contaminated waste from the hot cell portion of the 224-T Building. These decommissioning operations will be permitted and controlled with the initial and continued radiological surveys of the cell areas together with the safety analysis report, environmental documentation, and readiness reviews.

Phase III permitting requirements for "Conversion of Hot Cell Area to Storage Area" involves the preparation of a safety analysis report, an environmental impact report, readiness reviews, and a Part B Licensing Permit.

### 4.0 COST AND SCHEDULE FOR CONVERTING HOT CELL AREA TO STORAGE AREA

The project will be handled as a FY96 Line Item.

The estimated cost for this phase of this project is \$10,500,000. The cost estimate is given in Appendix I.

The budget authorized/budget outlay schedule is also shown in Appendix I.

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## APPENDIX G

### Cost Estimate and Budget Authorized/Budget Outlay Schedule Facility Upgrades (Phase I)

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ISER ENGINEERS HANFORD  
STINGHOUSE HANFORD CO  
B NO. ER5153  
LE NO. Z164SAA2

\*\* TEST - INTERACTIVE ESTIMATING \*\*  
224-T TRUSAF BUILDING UPGRADE --- PHASE 1  
STUDY ESTIMATE  
DOE\_R01 - PROJECT COST SUMMARY

PAGE 1 OF 9  
DATE 04/04/94 08:55:32  
BY HERB R

COST CODE	DESCRIPTION	ESCALATED TOTAL COST	CONTINGENCY X	TOTAL	TOTAL DOLLARS
000	ENGINEERING	750,000	35	260,000	1,010,000
501	BUILDINGS	2,260,000	35	790,000	3,050,000
600	UTILITIES	110,000	35	40,000	150,000
700	SPECIAL EQUIP/PROCESS SYSTEMS	270,000	35	90,000	360,000
	(ADJUSTED TO MEET DOE 5100.4)	10,000		20,000	30,000
=====					
PROJECT TOTAL		3,400,000	35	1,200,000	4,600,000

TYPE OF  
ESTIMATE STUDY ESTIMATE 04/04/94

ARCHITECT  
ENGINEER *HERB*

OPERATING  
CONTRACTOR

REMARKS:

SER ENGINEERS HANFORD  
TINGHOUSE HANFORD CO  
NO. ER5153  
E NO. Z164SAA2

\*\* TEST - INTERACTIVE ESTIMATING \*\*  
224-1 TRUSAF BUILDING UPGRADE --- PHASE 1  
STUDY ESTIMATE  
DOE\_R02 - WORK BREAKDOWN STRUCTURE SUMMARY

PAGE 2 OF 9  
DATE 04/04/94 08:56:41  
BY HERB R

S	DESCRIPTION	ESTIMATE SUBTOTAL	ONSITE INDIRECTS	SUB TOTAL	ESCALATION % TOTAL	SUB TOTAL	CONTINGENCY % TOTAL	TOTAL DOLLARS
100	DEFINITIVE DESIGN-CAT 2-ONSITE E/C	501200	0	501200	7.21	36137	35	725404
000	ENGINEERING/INSPECTION-ONSITE E/C	200400	0	200400	7.21	14449	35	290046
UBTOTAL 1	ENGINEERING	701600	0	701600	7.21	50586	35	1015450
010	ROOF & EXTERIOR WALL REPAIRS	83718	0	83718	7.21	6036	35	121168
020	LOADING DOCK & DRUM HANDLING EQUIP	64070	0	64070	7.21	4620	35	92731
040	ELECTRICAL SYSTEM UPG - GALLERY	346608	0	346608	7.21	24996	35	501773
051	DUCT MODS	251604	0	251604	7.21	18141	35	364155
053	PREHEAT COILS	21959	0	21959	7.21	1503	35	31782
054	HEPA FILTERS	18857	0	18857	7.21	1360	35	27292
055	EXHAUST STACK & STACK SAMPLER	123178	0	123178	7.21	8881	35	178280
056	O/S AIR PRESSURE REF SYSTEM	12707	0	12707	7.21	916	35	18391
057	HEATING/AIR CONDITIONING SYSTEM	299217	0	299217	7.21	21574	35	433067
060	FREIGHT ELEVATOR	156582	0	156582	7.21	11290	35	226627
070	SECURITY SYSTEM	121198	0	121198	7.21	8738	35	175414
080	COMMUNICATIONS SYSTEM	12000	0	12000	7.21	865	35	17368
090	FIRE ALARM SYSTEM	12000	0	12000	7.21	865	35	17368
100	INVENTORY CONTROL SYSTEM	10000	0	10000	7.21	721	35	14473
110	RAD & GAS MONITORING SYSTEM	20000	0	20000	7.21	1442	35	28947
120	MODULIZED DRUM STORAGE	192546	0	192546	7.21	13883	35	278678
UBTOTAL 31	FORCE ACCOUNT CONSTR - ONSI	1746324	0	1746324	7.21	125911	35	2527514
010	ROOF & EXTERIOR WALL REPAIRS	357000	125310	482310	7.21	34775	35	698064
030	AIR LOCK CONSTRUCTION	18000	10440	28440	7.21	2051	35	41162
UBTOTAL 32	CONSTRUCTION-FIXED PRICE	375000	135750	510750	7.21	36826	35	739226
000	PROJECT MANAGEMENT-O/C	200400	0	200400	7.21	14449	35	290046
UBTOTAL 34	PROJECT MANAGEMENT-O/C	200400	0	200400	7.21	14449	35	290046
UBTOTAL 3	CONSTRUCTION	2321724	135750	2457474	7.21	177186	35	3556706
JECT TOTAL		3,023,324	135,750	3,159,074	7.21	227,772	35	4,572,236

ISER ENGINEERS HANFORD  
STINGHOUSE HANFORD CO  
B NO. ER5153  
LE NO. 2164SAA2

\*\* TEST - INTERACTIVE ESTIMATING \*\*  
224-T TRUSAF BUILDING UPGRADE --- PHASE 1  
STUDY ESTIMATE  
DOE\_RD3 - ESTIMATE BASIS SHEET

PAGE 3 OF 9  
DATE 04/04/94 07:23:18  
BY HERB R

# DOCUMENTS AND DRAWINGS

DOCUMENTS: 224-T TRUSAF BUILDING UPGRADE, WORKPLAN.224 02/94

DRAWINGS: NONE

# MATERIAL PRICES

UNIT COSTS REPRESENT CURRENT PRICES FOR SPECIFIED MATERIAL.

# LABOR RATES

CURRENT KEN BASE CRAFT RATES, AS ISSUED BY KEN FINANCE (EFFECTIVE 10-01-93), INCLUDE FRINGE BENEFITS, LABOR INSURANCE, TAXES AND TRAVEL WHERE APPLICABLE, PER HANFORD SITE STABILIZATION AGREEMENT, APPENDIX A (EFFECTIVE 09-06-93). NON CRAFT HOURLY RATES ARE BASED ON THE 1994 FISCAL YEAR BUDGET LIQUIDATION RATES AS ISSUED BY KEN FINANCE (EFFECTIVE 10-01-93).

# GENERAL REQUIREMENTS/TECHNICAL SERVICES/OVERHEADS

- A.) ONSITE CONSTRUCTION FORCES GENERAL REQUIREMENTS, TECHNICAL SERVICES AND CRAFT OVERHEAD COSTS ARE INCLUDED AS A COMPOSITE PERCENTAGE BASED ON THE KEN ESTIMATING FACTOR/BILLING SCHEDULE, REVISION 16, DATED OCTOBER 01, 1993. THE TOTAL COMPOSITE PERCENTAGE APPLIED TO ONSITE CONSTRUCTION FORCES LABOR, FOR THIS PROJECT, IS 93% FOR SHOP WORK AND 134% FOR FIELD WORK, WHICH IS REFLECTED IN THE "ON&P/B&I" COLUMN OF THE ESTIMATE DETAIL.
- B.) ONSITE CONTRACT ADMINISTRATION AND CONSTRUCTION MANAGEMENT COSTS, ASSOCIATED WITH THE OVERALL MANAGEMENT OF THE FIXED PRICE CONTRACTS, ARE INCLUDED AS A COMPOSITE PERCENTAGE AND LUMP SUM ALLOWANCE (FOR BID PACKAGE PREP) BASED ON THE ESTIMATING FACTOR/BILLING SCHEDULE. THE TOTAL COMPOSITE PERCENTAGE AND LUMP SUM ALLOWANCE ARE APPLIED AGAINST THE TOTAL FIXED PRICE CONTRACT AMOUNT WHICH IS REFLECTED ON THE KEN SUMMARY REPORT DOER07, INCLUDED WITH THIS ESTIMATE. (FINAL ESTIMATES MAY BE PARTIALLY MANLOADED AND INCLUDED WITHIN THE ESTIMATE DETAIL)
- C.) FIXED PRICE CONTRACTOR OVERHEAD, PROFIT, BOND AND INSURANCE COSTS ARE INCLUDED IN THE SUBCONTRACT UNIT COST.

# ESCALATION

ESCALATION PERCENTAGES WERE CALCULATED BY THE HANFORD MATERIAL & LABOR ESCALATION STUDY, DATED FEBRUARY 1994.

# ROUNDING

U.S. DEPARTMENT OF ENERGY - DOE ORDER 5100.4 PAGE 1-32 SUBPARAGRAPH (M), REQUIRES ROUNDING OF ALL GENERAL PLANT PROJECTS (GPP'S) AND LINE ITEM (LI) COST ESTIMATES. REFERENCE: DOE 5100.4, FIGURE 1-11, DATED 10-31-84.

# REMARKS

- A.) THIS ESTIMATE IS BASED ON PRELIMINARY DATA AND SHOULD BE USED FOR COMPARISON OF ALTERNATIVES ONLY. THE ESTIMATE CONTAINS A MIXTURE OF REPAIR/MAINTENANCE AND CAPITAL CONSTRUCTION ACTIVITIES. THE NEED FOR, AND THE COSTS ASSOCIATED WITH OBTAINING SEPARATE FUNDING SOURCES WAS IGNORED.

ISER ENGINEERS HANFORD  
STINGHOUSE HANFORD CO  
P NO. ER5153  
LE NO. 2164SAAZ

\*\* TEST - INTERACTIVE ESTIMATING \*\*  
224-T TRUSAF BUILDING UPGRADE --- PHASE I  
STUDY ESTIMATE  
DOE\_R04 - COST CODE ACCOUNT SUMMARY

PAGE 4 OF 9  
DATE 04/04/94 00:55:51  
BY HERB R

ST DE/MS	DESCRIPTION	ESTIMATE SUBTOTAL	ONSITE INDIRECTS	SUB TOTAL	ESCALATION % TOTAL	SUB TOTAL	CONTINGENCY % TOTAL	TOTAL DOLLARS
<b>0 ENGINEERING</b>								
2100	DEFINITIVE DESIGN-CAT 2-ONSITE E/C	501200	0	501200	7.21	36137	35	725404
1000	ENGINEERING/INSPECTION-ONSITE E/C	200400	0	200400	7.21	14449	35	290046
TOTAL 000	ENGINEERING	701600	0	701600	7.21	50586	35	1015450
<b>1 BUILDINGS</b>								
1010	ROOF & EXTERIOR WALL REPAIRS	83710	0	83710	7.21	6036	35	121168
1020	LOADING DOCK & DRUM HANDLING EQUIP	64070	0	64070	7.21	4620	35	92731
1051	DUCT MODS	251604	0	251604	7.21	18141	35	364155
1053	PREHEAT COILS	21959	0	21959	7.21	1503	35	31782
1054	HEPA FILTERS	10857	0	10857	7.21	1360	35	27292
1055	EXHAUST STACK & STACK SAMPLER	123178	0	123178	7.21	8881	35	178280
1056	O/S AIR PRESSURE REF SYSTEM	12707	0	12707	7.21	916	35	18391
1057	HEATING/AIR CONDITIONING SYSTEM	299217	0	299217	7.21	21574	35	433067
1060	FREIGHT ELEVATOR	156582	0	156582	7.21	11290	35	226627
1070	SECURITY SYSTEM	121198	0	121198	7.21	8738	35	175414
1080	COMMUNICATIONS SYSTEM	12000	0	12000	7.21	865	35	17368
1090	FIRE ALARM SYSTEM	12000	0	12000	7.21	865	35	17368
1100	INVENTORY CONTROL SYSTEM	10000	0	10000	7.21	721	35	14473
1110	RAD & GAS MONITORING SYSTEM	20000	0	20000	7.21	1442	35	28947
1120	MODULIZED DRUM STORAGE	192546	0	192546	7.21	13083	35	278678
1010	ROOF & EXTERIOR WALL REPAIRS	357000	125310	482310	7.21	34775	35	698064
1030	AIR LOCK CONSTRUCTION	18000	10440	28440	7.21	2051	35	41162
0000	PROJECT MANAGEMENT-O/C	200400	0	200400	7.21	14449	35	290046
TOTAL 501	BUILDINGS	1975036	135750	2110786	7.21	152190	35	3055013
<b>0 UTILITIES</b>								
1040	ELECTRICAL SYSTEM UPG - GALLERY	99112	0	99112	7.21	7146	35	143448
TOTAL 600	UTILITIES	99112	0	99112	7.21	7146	35	143448
<b>0 SPECIAL EQUIP/PROCESS SYSTEMS</b>								

USER ENGINEERS HANFORD  
 STINGHOUSE HANFORD CO  
 B NO. ER5153  
 LE NO. 2164SAA2

\*\* BEST - INTERACTIVE ESTIMATING \*\*  
 224-T TRUSAF BUILDING UPGRADE --- PHASE I  
 STUDY ESTIMATE  
 DOE\_R04 - COST CODE ACCOUNT SUMMARY

PAGE 5 OF 9  
 DATE 04/04/94 08:55:51  
 BY KERB R

ST DE/WBS	DESCRIPTION	ESTIMATE SUBTOTAL	ONSITE INDIRECTS	SUB TOTAL	ESCALATION X TOTAL	SUB TOTAL	CONTINGENCY X TOTAL	TOTAL DOLLARS
1040	ELECTRICAL SYSTEM UPG - GALLERY	247576	0	247576	7.21 17850	265426	35 92899	358325
TOTAL 700	SPECIAL EQUIP/PROCESS SYSTEM	247576	0	247576	7.21 17050	265426	35 92899	358325
*****								
OBJECT TOTAL		3,023,324	135,750	3,159,074	7.21 227,772	3,386,846	35 1,185,397	4,572,236

ISER ENGINEERS HANFORD  
 STINGHOUSE HANFORD CO  
 B NO. ERS153  
 LE NO. Z164SAA2

\*\* TEST - INTERACTIVE ESTIMATING \*\*  
 224-T TRUSAF BUILDING UPGRADE --- PHASE I  
 STUDY ESTIMATE  
 DOE\_R05 - ESTIMATE SUMMARY BY CSI DIVISION

PAGE 6 OF 9  
 DATE 04/04/94 08:56:03  
 BY HERB R

SI	DESCRIPTION	ESTIMATE SUBTOTAL	ONSITE INDIRECTS	SUB TOTAL	ESCALATION % TOTAL	SUB TOTAL	CONTINGENCY % TOTAL	TOTAL DOLLARS
<b>ENGINEERING</b>								
0	TECHNICAL SERVICES	701600	0	701600	7.21	50506	35	1015450
<b>TOTAL ENGINEERING</b>		701,600	0	701,600	7.21	50,506	35	1,015,450
<b>CONSTRUCTION</b>								
1	GENERAL REQUIREMENTS	200400	0	200400	7.21	14449	35	290046
3	CONCRETE	124038	0	124038	7.21	9001	35	180682
5	METALS	368839	125310	494149	7.21	35629	35	715199
7	MOISTURE AND THERMAL	83710	0	83710	7.21	6036	35	121168
3	DOORS, WINDOWS AND G	121198	0	121198	7.21	8738	35	175414
3	SPECIALTIES	240435	0	240435	7.21	17336	35	347990
1	EQUIPMENT	54086	10440	64526	7.21	4653	35	93391
3	MECHANICAL	727522	0	727522	7.21	52455	35	1052967
5	ELECTRICAL	400688	0	400688	7.21	28889	35	579929
<b>TOTAL CONSTRUCTION</b>		2,321,724	135,750	2,457,474	7.21	177,186	35	3,556,706
<b>PROJECT TOTAL</b>		3,023,324	135,750	3,159,074	7.21	227,772	35	4,572,236

SEA ENGINEERS HANFORD  
TINGHOUSE HANFORD CO  
NO. ER5153  
E NO. 2164SAA2

\*\* TEST - INTERACTIVE ESTIMATING \*\*  
224-T TRUSAF BUILDING UPGRADE --- PHASE 1  
STUDY ESTIMATE  
DOE\_R07 - ONSITE INDIRECT COSTS BY WBS

PAGE 9 OF 9  
DATE 04/04/94 08:56:13  
BY HERB R

DESCRIPTION	ESTIMATE SUBTOTAL	CONTRACT X	ADMINISTRATION TOTAL	BID PACK PREP.	OTHER INDIRECTS	TOTAL INDIRECTS
*****	*****	*****	*****	*****	*****	*****
100 DEFINITIVE DESIGN-CAT 2-ONSITE E/C	501200	0.00	0	0	0	0
000 ENGINEERING/INSPECTION-ONSITE E/C	200400	0.00	0	0	0	0
010 ROOF & EXTERIOR WALL REPAIRS	83718	0.00	0	0	0	0
020 LOADING DOCK & DRUM HANDLING EQUIP	64070	0.00	0	0	0	0
040 ELECTRICAL SYSTEM UPG - GALLERY	346688	0.00	0	0	0	0
051 DUCT MODS	251604	0.00	0	0	0	0
053 PREHEAT COILS	21959	0.00	0	0	0	0
054 HEPA FILTERS	18057	0.00	0	0	0	0
055 EXHAUST STACK & STACK SAMPLER	123178	0.00	0	0	0	0
056 O/S AIR PRESSURE REF SYSTEM	12707	0.00	0	0	0	0
057 HEATING/AIR CONDITIONING SYSTEM	299217	0.00	0	0	0	0
060 FREIGHT ELEVATOR	156582	0.00	0	0	0	0
070 SECURITY SYSTEM	121198	0.00	0	0	0	0
080 COMMUNICATIONS SYSTEM	12000	0.00	0	0	0	0
090 FIRE ALARM SYSTEM	12000	0.00	0	0	0	0
100 INVENTORY CONTROL SYSTEM	10000	0.00	0	0	0	0
110 RAD & GAS MONITORING SYSTEM	20000	0.00	0	0	0	0
120 MODULIZED DRUM STORAGE	192546	0.00	0	0	0	0
010 ROOF & EXTERIOR WALL REPAIRS	357000	33.00	117810	7500	0	125310
030 AIR LOCK CONSTRUCTION	18000	33.00	5940	4500	0	10440
000 PROJECT MANAGEMENT-O/C	200400	0.00	0	0	0	0
*****						
PROJECT TOTAL	3,023,324		123,750	12,000	0	135,750

**KAISER  
ENGINEERS  
HANFORD**

**224-T BUILDING - PHASE I  
FACILITY UPGRADES  
BA/BO SCHEDULE - EXPENSE**

	Total Cost	FY 1995				FY 1996				FY 1997				FY 1998				FY 1999				FY 2000			
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
1.0 ENGINEERING	725	725 / 725																							
1.2 E & I	290					100 / 100				100 / 100				90 / 90											
3.0 CONSTRUCTION	3267					1500 / 1500				1500 / 1500				267 / 267											
4.0 PROJECT MANAGEMENT	290	80 / 80				80 / 80				80 / 80				50 / 50											
Total BA/BO	4572	805 / 805				1680 / 1680				1680 / 1680				407 / 407											

Dollars In Thousands

## APPENDIX H

### Cost Estimate and Budget Authorized/Budget Outlay Schedule Decontamination of Hot Cell Area (Phase II)

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AISER ENGINEERS HANFORD  
ESTINGHOUSE HANFORD COMPANY  
DB NO. ER5153  
ILE NO. 2164SAB1

\*\* TEST - INTERACTIVE ESTIMATING \*\*  
DECONTAMINATION OF HOT CELL AREA  
ROUGH ORDER OF MAGNITUDE (ROM) ESTIMATE  
DOE\_R01 - PROJECT COST SUMMARY

PAGE 1 OF 10  
DATE 04/22/94 08:35:46  
BY AKL

COST CODE *****	DESCRIPTION *****	ESCALATED TOTAL COST *****	CONTINGENCY % *****	TOTAL TOTAL *****	TOTAL DOLLARS *****
000	ENGINEERING	460,000	35	160,000	620,000
501	BUILDINGS	550,000	35	190,000	740,000
700	SPECIAL EQUIP/PROCESS SYSTEMS	6,320,000	35	2,210,000	8,530,000
	(ADJUSTED TO MEET DOE \$100.4)	-30,000		40,000	10,000
*****					
PROJECT TOTAL		7,300,000	35	2,600,000	9,900,000

H-1

TYPE OF ESTIMATE	ROUGH ORDER OF MAGNITUDE	APRIL 22, 1994	REMARKS:	PHASE II
ARCHITECT ENGINEER	<i>Chellor</i>			
OPERATING CONTRACTOR				

AISER ENGINEERS HANFORD  
ESTINGHOUSE HANFORD COMPANY  
OB NO. ER5153

**\*\* TEST - INTERACTIVE ESTIMATING \*\***  
**DECONTAMINATION OF HOT CELL AREA**  
**ROUGH ORDER OF MAGNITUDE (ROM) ESTIMATE**  
**DOE\_RO2 - WORK BREAKDOWN STRUCTURE SUMMARY**

PAGE 2 OF 10  
DATE 04/22/94 08:35:59  
BY AKL

WBS	DESCRIPTION	ESTIMATE SUBTOTAL	ONSITE INDIRECTS	SUB TOTAL	ESCALATION X TOTAL	SUB TOTAL	CONTINGENCY X TOTAL	TOTAL DOLLARS
21100	DESIGN EXHAUST SYSTEM	310637	0	310637	2.04	8022	319459	431270
27100	DESIGN TEMP SUPPLY SYSTEMS	67268	0	67268	2.04	1910	69178	93391
	SUBTOTAL 1 ENGINEERING	377905	0	377905	2.04	10732	388637	524661
21100	PROCUREMENT - EXHAUST EQUIP.	1004000	0	1004000	11.25	112950	1116950	1507883
	SUBTOTAL 2 PROCUREMENT	1004000	0	1004000	11.25	112950	1116950	1507883
21200	INSTALL EXHAUSTER	68187	0	68187	11.25	7671	75858	102408
21300	SEAL BUILDING OPENINGS	46337	0	46337	11.25	5213	51550	69592
	SUBTOTAL 321 INSTALL VENTILATION SYSTEM	114524	0	114524	11.25	12884	127408	172000
22100	CHANGE ROOMS	11493	0	11493	11.25	1293	12786	17261
22200	SAFETY DEVICES	2314	0	2314	11.24	260	2574	3475
	SUBTOTAL 322 PROVIDE PERSONNEL NEEDS	13807	0	13807	11.25	1553	15360	20736
23100	CONST. AIRLOCKS OUTSIDE DOORS	93566	0	93566	11.25	10526	104092	140524
23200	CONSTRUCT E-CELL ISO WALL	37622	0	37622	11.25	4232	41854	56504
	SUBTOTAL 323 ESTABLISH AIRLOCKS ON CELLS	131188	0	131188	11.25	14758	145946	197028
24100	PICK/VACUUM DEBRIS	151986	0	151986	11.25	17098	169084	228264
24200	WASH DOWN CELLS	144690	0	144690	11.25	16279	160977	217318
	SUBTOTAL 324 HOUSEKEEPING IN CELLS	296684	0	296684	11.25	33377	330061	445502
25100	CONNECT DRAIN TO C-7	11679	0	11679	11.25	1314	12993	17540
25200	CUT DOORWAYS BETWEEN CELLS	26060	0	26060	11.25	2932	28992	39139
25300	ISOLATE OUTSIDE SYSTEMS	33370	0	33370	11.25	3754	37124	50118
	SUBTOTAL 325 MODIFY FACILITY	71109	0	71109	11.25	8000	79109	106797
26100	THIRD PARTY INSPECTION	7570	0	7570	11.25	852	8422	11369

ATSER ENGINEERS HANFORD  
ESTINGHOUSE HANFORD COMPANY  
OB NO. ER5153

\*\* TEST - INTERACTIVE ESTIMATING \*\*  
DECONTAMINATION OF HOT CELL AREA  
ROUGH ORDER OF MAGNITUDE (ROM) ESTIMATE  
DOE\_R02 - WORK BREAKDOWN STRUCTURE SUMMARY

PAGE 3 OF 10  
DATE 04/22/94 08:35:59  
BY AKL

WBS	DESCRIPTION	ESTIMATE SUBTOTAL	ONSITE INDIRECTS	SUB TOTAL	ESCALATION X TOTAL	SUB TOTAL	CONTINGENCY X TOTAL	TOTAL DOLLARS
26200	REPAIR AND LUBRICATE	20224	0	20224	11.25	2275	35	30374
26300	INSTALL SCAFFOLDING CLAMPS	5893	0	5893	11.25	663	35	8051
	SUBTOTAL 326 PREPARE CRANE FOR SERVICE	33687	0	33687	11.25	3790	35	50594
27400	ICF-KH SITE FORCES	128010	0	128010	11.25	14401	35	192255
	SUBTOTAL 327 PROVIDE D&D UTILITIES	128010	0	128010	11.25	14401	35	192255
	SUBTOTAL 32 MOBILIZE AND BUILDING PREP.	789009	0	789009	11.25	88763	35	1184992
30000	METAL BUILDING	402500	117700	520200	4.93	25646	35	736092
	SUBTOTAL 33 NEW FACILITY	402500	117700	520200	4.93	25646	35	736092
41000	REMOVE CENTRIFUGES	165741	0	165741	11.25	18646	35	248922
42000	ISOLATE CELLS	69638	0	69638	11.25	7834	35	104588
43000	DISMANTLE PIPING	145051	0	145051	11.25	16318	35	217848
44000	REMOVE EQUIPMENT FOR DISPOSAL	1042366	0	1042366	11.25	117266	35	1565503
45000	REMOVE EQUIPMENT FOR DISPOSAL	562071	0	562071	11.25	63233	35	844160
	SUBTOTAL 34 A THROUGH E CELL D&D	1984867	0	1984867	11.25	223297	35	2981021
51000	ESTABLISH CONTAMINATION CONTROL	44971	0	44971	11.25	5059	35	67541
52000	DISMANTLE PIPING	111002	0	111002	11.25	12488	35	166711
53000	REMOVE EQUIPMENT	138405	0	138405	11.25	15571	35	207867
54000	DISMANTLE LOADOUT HOOD	268603	0	268603	11.25	30218	35	403408
55000	DECONTAMINATE CELL AREA	117974	0	117974	11.25	13272	35	177182
	SUBTOTAL 35 F CELL D&D	680955	0	680955	11.25	76608	35	1022709
60000	SUPPORT DURING DURATION OF PROJ.	1226298	0	1226298	11.25	137959	35	1841746
	SUBTOTAL 36 ADDITIONAL SUPPORT	1226298	0	1226298	11.25	137959	35	1841746
	SUBTOTAL 3 CONSTRUCTION	5083629	117700	5201329	10.62	552273	35	7767360

HAISER ENGINEERS HANFORD  
WESTINGHOUSE HANFORD COMPANY  
JOB NO. ER5153

\*\* TEST - INTERACTIVE ESTIMATING \*\*  
DECONTAMINATION OF HOT CELL AREA  
ROUGH ORDER OF MAGNITUDE (ROM) ESTIMATE  
DOE\_R02 - WORK BREAKDOWN STRUCTURE SUMMARY

PAGE 4 OF 10  
DATE 04/22/94 08:35:59  
BY AKL

WBS DESCRIPTION	ESTIMATE SUBTOTAL	ONSITE INDIRECTS	SUB TOTAL	ESCALATION % TOTAL	SUB TOTAL	CONTINGENCY % TOTAL	TOTAL DOLLARS
10000 PROJECT PLANNING & CONTROL	66866	0	66866	7.70	5149	35	97220
SUBTOTAL 4 PROJECT INTEGRATION	66866	0	66866	7.70	5149	35	97220
PROJECT TOTAL	6,532,400	117,700	6,650,100	10.24	681,104	35	9,897,124

WISER ENGINEERS HANFORD  
WESTINGHOUSE HANFORD COMPANY  
JOB NO. ER5153

\*\* TEST - INTERACTIVE ESTIMATING \*\*  
100-AREAS DECOMMISSIONING PROJECTS  
224-T CELL DECOMMISSIONING  
DOE\_R03 - ESTIMATE BASIS SHEET

PAGE 5 OF 10  
DATE 04/22/94 08:51:32  
BY AKL

# DOCUMENTS AND DRAWINGS

DOCUMENTS: ROUGH ORDER OF MAGNITUDE (ROM) ESTIMATE BY EUGENE SENGER, DATED MARCH 24, 1994

DRAWINGS:

## MATERIAL PRICES

UNIT COSTS REPRESENT CURRENT PRICES FOR SPECIFIED MATERIAL.

## LABOR RATES

CURRENT KEH BASE CRAFT RATES, AS ISSUED BY KEH FINANCE (EFFECTIVE 10-01-93), INCLUDE FRINGE BENEFITS, LABOR INSURANCE, TAXES AND TRAVEL WHERE APPLICABLE, PER HANFORD SITE STABILIZATION AGREEMENT, APPENDIX A (EFFECTIVE 09-06-93). NON CRAFT HOURLY RATES ARE BASED ON THE 1994 FISCAL YEAR BUDGET LIQUIDATION RATES AS ISSUED BY KEH FINANCE (EFFECTIVE 10-01-93).

## GENERAL REQUIREMENTS/TECHNICAL SERVICES/OVERHEADS

- A.) ONSITE CONSTRUCTION FORCES GENERAL REQUIREMENTS, TECHNICAL SERVICES AND CRAFT OVERHEAD COSTS ARE INCLUDED AS A COMPOSITE PERCENTAGE BASED ON THE KEH ESTIMATING FACTOR/BILLING SCHEDULE, REVISION 16, DATED OCTOBER 01, 1993. THE TOTAL COMPOSITE PERCENTAGE APPLIED TO ONSITE CONSTRUCTION FORCES LABOR, FOR THIS PROJECT, IS 93% FOR SHOP WORK AND 134% FOR FIELD WORK, WHICH IS REFLECTED IN THE "OH&P/B&I" COLUMN OF THE ESTIMATE DETAIL.
- B.) ONSITE CONTRACT ADMINISTRATION AND CONSTRUCTION MANAGEMENT COSTS, ASSOCIATED WITH THE OVERALL MANAGEMENT OF THE FIXED PRICE CONTRACTS, ARE INCLUDED AS A COMPOSITE PERCENTAGE AND LUMP SUM ALLOWANCE (FOR BID PACKAGE PREP) BASED ON THE ESTIMATING FACTOR/BILLING SCHEDULE. THE TOTAL COMPOSITE PERCENTAGE AND LUMP SUM ALLOWANCE ARE APPLIED AGAINST THE TOTAL FIXED PRICE CONTRACT AMOUNT WHICH IS REFLECTED ON THE KEH SUMMARY REPORT DOER07, INCLUDED WITH THIS ESTIMATE. (FINAL ESTIMATES MAY BE PARTIALLY MANLOADED AND INCLUDED WITHIN THE ESTIMATE DETAIL)
- C.) FIXED PRICE CONTRACTOR OVERHEAD, PROFIT, BOND AND INSURANCE COSTS HAVE BEEN APPLIED AT THE FOLLOWING PERCENTAGES AND ARE REFLECTED IN THE "OH&P/B&I" COLUMN OF THE ESTIMATE DETAIL:  
LABOR - 0% MATERIAL - 0% EQUIPMENT USAGE - 0% EQUIPMENT - 0% SUBCONTRACTS - 0%

## ESCALATION

ESCALATION PERCENTAGES WERE CALCULATED BY THE HANFORD MATERIAL & LABOR ESCALATION STUDY, DATED FEBRUARY 1993.

## ROUNDING

U.S. DEPARTMENT OF ENERGY - DOE ORDER 5100.4 PAGE 1-32 SUBPARAGRAPH (H), REQUIRES ROUNDING OF ALL GENERAL PLANT PROJECTS (GPP'S) AND LINE ITEM (LI) COST ESTIMATES. REFERENCE: DOE 5100.4, FIGURE 1-11, DATED 10-31-84.

## REMARKS

- A.) THIS ESTIMATE INCLUDES EXTRACTED AND SUMMARIZED DATA FROM THE WESTINGHOUSE HANFORD COMPANY COST ESTIMATE BY GENE SENGER, DATED MARCH 24, 1994. ALL ESTIMATING FACTORS, CRAFT WAGE RATES, ETC., ALONG WITH ESTIMATOR ALLOWANCES, WERE ALSO EXTRACTED AND USED THROUGHOUT THIS ESTIMATE. MINOR CORRECTIONS WERE INCORPORATED FOR OUR INTERPRETATION OF MATH CALCULATIONS.
- B.) COSTS INCLUDED WITHIN WBS 3.3.0.0.0.0 WERE PROVIDED BY THE ICF-KH ESTIMATING DEPARTMENT. SCOPE FOR THE FACILITY WAS PROVIDED VERBALLY BY THE WHC PROJECT MANAGER ALONG WITH THE ICF-KH REPRESENTATIVE.
- C.) THE WBS FORMAT DOES NOT FOLLOW ANY STANDARD PROCEDURE. EVERY EFFORT WAS MADE TO MATCH SPECIFIC WBS ACCOUNTS WITH THE WHC

AISER ENGINEERS HANFORD  
ESTINGHOUSE HANFORD COMPANY  
OB NO. ER5153

\*\* TEST - INTERACTIVE ESTIMATING \*\*  
DECONTAMINATION OF HOT CELL AREA  
ROUGH ORDER OF MAGNITUDE (ROM) ESTIMATE  
DOE\_R04 - COST CODE ACCOUNT SUMMARY

PAGE 6 OF 10  
DATE 04/22/94 08:36:11  
BY AKL

COST CODE/CHS	DESCRIPTION	ESTIMATE SUBTOTAL	ONSITE INDIRECTS	SUB TOTAL	ESCALATION X TOTAL	SUB TOTAL	CONTINGENCY X TOTAL	TOTAL DOLLARS
<b>100 ENGINEERING</b>								
121100	DESIGN EXHAUST SYSTEM	310637	0	310637	2.84	8822	319459	431270
127100	DESIGN TEMP SUPPLY SYSTEMS	67268	0	67268	2.84	1910	69178	93391
10000	PROJECT PLANNING & CONTROL	66866	0	66866	7.70	5149	72015	97220
TOTAL 000	ENGINEERING	444771	0	444771	3.57	15881	460652	621881
<b>501 BUILDINGS</b>								
530000	METAL BUILDING	402500	117700	520200	4.93	25646	545846	736892
TOTAL 501	BUILDINGS	402500	117700	520200	4.93	25646	545846	736892
<b>700 SPECIAL EQUIP/PROCESS SYSTEMS</b>								
221100	PROCUREMENT - EXHAUST EQUIP.	1004000	0	1004000	11.25	112950	1116950	1507883
321200	INSTALL EXHAUSTER	68187	0	68187	11.25	7671	75858	102408
321300	SEAL BUILDING OPENINGS	46337	0	46337	11.25	5213	51550	69592
322100	CHANGE ROOMS	11493	0	11493	11.25	1293	12786	17261
322200	SAFETY DEVICES	2314	0	2314	11.24	260	2574	3475
323100	CONST. AIRLOCKS OUTSIDE DOORS	93566	0	93566	11.25	10526	104092	140524
323200	CONSTRUCT E-CELL ISO WALL	37622	0	37622	11.25	4232	41854	56504
324100	PICK/VACUUM DEBRIS	151986	0	151986	11.25	17098	169084	228264
324200	WASH DOWN CELLS	144698	0	144698	11.25	16279	160977	217318
325100	CONNECT DRAIN TO C-7	11679	0	11679	11.25	1314	12993	17540
325200	CUT DOORWAYS BETWEEN CELLS	26060	0	26060	11.25	2932	28992	39139
325300	ISOLATE OUTSIDE SYSTEMS	33370	0	33370	11.25	3754	37124	50118
326100	THIRD PARTY INSPECTION	7570	0	7570	11.25	852	8422	11369
326200	REPAIR AND LUBRICATE	20224	0	20224	11.25	2275	22499	30374
326300	INSTALL SCAFFOLDING CLAMPS	5893	0	5893	11.25	663	6556	8851
327400	ICF-KN SITE FORCES	128010	0	128010	11.25	14401	142411	192255
341000	REMOVE CENTRIFUGES	165741	0	165741	11.25	18646	184307	248922
342000	ISOLATE CELLS	69638	0	69638	11.25	7834	77472	104588
343000	DISMANTLE PIPING	145051	0	145051	11.25	16318	161369	217848
344000	REMOVE EQUIPMENT FOR DISPOSAL	1042366	0	1042366	11.25	117266	1159632	1565503
345000	REMOVE EQUIPMENT FOR DISPOSAL	562071	0	562071	11.25	63233	625304	844160
351000	ESTABLISH CONTAMINATION CONTROL	44971	0	44971	11.25	5059	50030	67541

KAISER ENGINEERS HANFORD  
 WESTINGHOUSE HANFORD COMPANY  
 JOB NO. ER5153

\*\* TEST - INTERACTIVE ESTIMATING \*\*  
 DECONTAMINATION OF HOT CELL AREA  
 ROUGH ORDER OF MAGNITUDE (ROM) ESTIMATE  
 DOE\_R04 - COST CODE ACCOUNT SUMMARY

PAGE 7 OF 10  
 DATE 04/22/94 08:36:12  
 BY AKL

COST CODE/WBS	DESCRIPTION	ESTIMATE SUBTOTAL	ONSITE INDIRECTS	SUB TOTAL	ESCALATION X TOTAL	SUB TOTAL	CONTINGENCY X TOTAL	TOTAL DOLLARS
152000	DISMANTLE PIPING	111002	0	111002	11.25	12488	35	166711
153000	REMOVE EQUIPMENT	138405	0	138405	11.25	15571	35	207867
154000	DISMANTLE LOADOUT HOOD	268603	0	268603	11.25	30210	35	403408
155000	DECONTAMINATE CELL AREA	117974	0	117974	11.25	13272	35	177102
160000	SUPPORT DURING DURATION OF PROJ.	1226298	0	1226298	11.25	137959	35	1841746
TOTAL 700	SPECIAL EQUIP/PROCESS SYSTEM	5685129	0	5685129	11.25	639577	35	8538351
=====								
PROJECT TOTAL		6,532,400	117,700	6,650,100	10.24	681,104	35	9,077,124

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HAISER ENGINEERS HANFORD  
 WESTINGHOUSE HANFORD COMPANY  
 JOB NO. ER5153

\*\* TEST - INTERACTIVE ESTIMATING \*\*  
 DECONTAMINATION OF HOT CELL AREA  
 ROUGH ORDER OF MAGNITUDE (ROM) ESTIMATE  
 DOE\_R05 - ESTIMATE SUMMARY BY CSI DIVISION

PAGE 8 OF 10  
 DATE 04/22/94 08:36:39  
 BY AKL

CSI DESCRIPTION	ESTIMATE SUBTOTAL	ONSITE INDIRECTS	SUB TOTAL	ESCALATION X TOTAL	SUB TOTAL	CONTINGENCY X TOTAL	TOTAL DOLLARS
<b>ENGINEERING</b>							
00 TECHNICAL SERVICES	444771	0	444771	3.57	15881	35	621081
TOTAL ENGINEERING	444,771	0	444,771	3.57	15,881	35	621,081
<b>CONSTRUCTION</b>							
00 TECHNICAL SERVICES	2230298	0	2230298	11.25	250909	35	3349629
13 SPECIAL CONSTRUCTION	402500	117700	520200	4.93	25646	35	736892
15 MECHANICAL	3454831	0	3454831	11.25	388660	35	5108722
TOTAL CONSTRUCTION	6,087,629	117,700	6,205,329	10.72	665,223	35	9,275,243
<b>PROJECT TOTAL</b>	<b>6,532,400</b>	<b>117,700</b>	<b>6,650,100</b>	<b>10.24</b>	<b>681,104</b>	<b>35</b>	<b>9,897,124</b>

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KAISER ENGINEERS HANFORD  
WESTINGHOUSE HANFORD COMPANY  
JOB NO. ER5153

\*\* TEST - INTERACTIVE ESTIMATING \*\*  
100-AREAS DECOMMISSIONING PROJECTS  
224-1 CELL DECOMMISSIONING  
DOE\_R06 - CONTINGENCY ANALYSIS BASIS SHEET

PAGE 9 OF 10  
DATE 04/22/94 08:52:17  
BY AKL

REFERENCE: ESTIMATE BASIS SHEET  
COST CODE ACCOUNT SUMMARY

PAGE 5 OF 10  
PAGE 6 OF 10

THE U.S. DEPARTMENT OF ENERGY - RICHLAND ORDER 5700.3 "COST ESTIMATING, ANALYSIS AND STANDARDIZATION" DATED 3-27-85, PROVIDES GUIDELINES FOR ESTIMATE CONTINGENCIES. THE GUIDELINE FOR A STUDY (ROM) ESTIMATE SHOULD HAVE AN OVERALL RANGE OF 20% TO 30% WITH AN EXPERIMENTAL/SPECIAL CONDITIONS RANGE TO 50%.

CONTINGENCY IS EVALUATED AT THE THIRD COST CODE LEVEL AND SUMMARIZED AT THE PRIMARY AND SECONDARY COST CODE LEVEL OF THE DETAILED COST ESTIMATE.

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#### ENGINEERING AND CONSTRUCTION

AN OVERALL CONTINGENCY OF 35% WAS EXTRACTED FROM THE WESTINGHOUSE HANFORD COMPANY COST ESTIMATE THAT WAS USED AS THE BASIS FOR THIS ESTIMATE. THE APPLICATION OF THIS CONTINGENCY PERCENTAGE WAS BASED ON THE ORIGINAL WHC ESTIMATORS JUDGEMENT. A 35% CONTINGENCY WAS ALSO APPLIED TO THE ICF-KH INPUT TO THIS ESTIMATE DUE TO THE VERY LIMITED SCOPE DEFINITION AT THIS TIME.

AVERAGE PROJECT CONTINGENCY 35%

WISER ENGINEERS HANFORD  
ESTINGHOUSE HANFORD COMPANY  
OB NO. ER5153

\*\* TEST - INTERACTIVE ESTIMATING \*\*  
DECONTAMINATION OF HOT CELL AREA  
ROUGH ORDER OF MAGNITUDE (ROM) ESTIMATE  
DOE\_R07 - ONSITE INDIRECT COSTS BY WBS

PAGE 10 OF 10  
DATE 04/22/94 08:36:59  
BY AKL

BS	DESCRIPTION	ESTIMATE SUBTOTAL	CONTRACT X	ADMINISTRATION TOTAL	BID PACK PREP.	OTHER INDIRECTS	TOTAL INDIRECTS
*****	*****	*****	*****	*****	*****	*****	*****
21100	DESIGN EXHAUST SYSTEM	310637	0.00	0	0	0	0
27100	DESIGN TEMP SUPPLY SYSTEMS	67268	0.00	0	0	0	0
21100	PROCUREMENT - EXHAUST EQUIP.	1004000	0.00	0	0	0	0
21200	INSTALL EXHAUSTER	68187	0.00	0	0	0	0
21300	SEAL BUILDING OPENINGS	46337	0.00	0	0	0	0
22100	CHANGE ROOMS	11493	0.00	0	0	0	0
22200	SAFETY DEVICES	2314	0.00	0	0	0	0
23100	CONST. AIRLOCKS OUTSIDE DOORS	93566	0.00	0	0	0	0
23200	CONSTRUCT E-CELL ISO WALL	37622	0.00	0	0	0	0
24100	PICK/VACUUM DEBRIS	151986	0.00	0	0	0	0
24200	WASH DOWN CELLS	144698	0.00	0	0	0	0
25100	CONNECT DRAIN TO C-7	11679	0.00	0	0	0	0
25200	CUT DOORWAYS BETWEEN CELLS	26060	0.00	0	0	0	0
25300	ISOLATE OUTSIDE SYSTEMS	33370	0.00	0	0	0	0
26100	THIRD PARTY INSPECTION	7570	0.00	0	0	0	0
26200	REPAIR AND LUBRICATE	20224	0.00	0	0	0	0
26300	INSTALL SCAFFOLDING CLAMPS	5893	0.00	0	0	0	0
27400	ICF-KH SITE FORCES	128010	0.00	0	0	0	0
30000	METAL BUILDING	402500	28.00	112700	5000	0	117700
41000	REMOVE CENTRIFUGES	165741	0.00	0	0	0	0
42000	ISOLATE CELLS	69638	0.00	0	0	0	0
43000	DISMANTLE PIPING	145051	0.00	0	0	0	0
44000	REMOVE EQUIPMENT FOR DISPOSAL	1042366	0.00	0	0	0	0
45000	REMOVE EQUIPMENT FOR DISPOSAL	562071	0.00	0	0	0	0
51000	ESTABLISH CONTAMINATION CONTROL	44971	0.00	0	0	0	0
52000	DISMANTLE PIPING	111002	0.00	0	0	0	0
53000	REMOVE EQUIPMENT	138405	0.00	0	0	0	0
54000	DISMANTLE LOADOUT HOOD	268603	0.00	0	0	0	0
55000	DECONTAMINATE CELL AREA	117974	0.00	0	0	0	0
60000	SUPPORT DURING DURATION OF PROJ.	1226298	0.00	0	0	0	0
10000	PROJECT PLANNING & CONTROL	66866	0.00	0	0	0	0
PROJECT TOTAL		6,532,400		112,700	5,000	0	117,700

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## H-11

	Total Cost	FY 1995				FY 1996				FY 1997				FY 1998				FY 1999				FY 2000			
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
1.0 ENGINEERING	525	525 / 525																							
2.1 PROCUREMENT	1508	1501 / 1501																							
3.0 CONSTRUCTION	7767					3000 / 3000				3000 / 3000				1767 / 1767											
4.0 PROJECT MANAGEMENT	97	25 / 25				25 / 25				25 / 25				22 / 22											
Total BA/BO	9897	2051 / 2051				3025 / 3025				3025 / 3025				1789 / 1789											

Dollars in Thousands

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## APPENDIX I

### Cost Estimate and Budget Authorized/Budget Outlay Schedule Conversion of Hot Cell Area to Storage Area (Phase III)

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KAISER ENGINEERS HANFORD  
WESTINGHOUSE HANFORD COMPANY  
JOB NO. ER5153  
FILE NO. Z164SAC1

\*\* TEST - INTERACTIVE ESTIMATING \*\*  
CONVERSION OF HOT CELL AREA TO STORAGE AREA  
ROUGH ORDER OF MAGNITUDE (ROM)  
DOE\_R01 - PROJECT COST SUMMARY

PAGE 1 OF 7  
DATE 04/25/94 10:53:23  
BY AKL

COST CODE *****	DESCRIPTION *****	ESCALATED TOTAL COST *****	CONTINGENCY % *****	TOTAL TOTAL *****	TOTAL DOLLARS *****
000	ENGINEERING	1,060,000	25	260,000	1,320,000
700	SPECIAL EQUIP/PROCESS SYSTEMS	7,140,000	20	2,030,000	9,170,000
	(ADJUSTED TO MEET DOE 5100.4)	0		10,000	10,000
=====					
PROJECT TOTAL		8,200,000	20	2,300,000	10,500,000

1-1

TYPE OF ESTIMATE	ROUGH ORDER OF MAGNITUDE	APRIL 25, 1994	REMARKS:	PHASE III
ARCHITECT ENGINEER	<i>Chellid</i>			
OPERATING CONTRACTOR				

(ROUNDED/ADJUSTED TO THE NEAREST " 10,000 / 100,000 " - PERCENTAGES NOT RECALCULATED TO REFLECT ROUNDING)

KAISER ENGINEERS HANFORD  
WESTINGHOUSE HANFORD COMPANY  
JOB NO. ER5153

\*\* TEST - INTERACTIVE ESTIMATING \*\*  
CONVERSION OF HOT CELL AREA TO STORAGE AREA  
ROUGH ORDER OF MAGNITUDE (ROM)  
DOE\_R02 - WORK BREAKDOWN STRUCTURE SUMMARY

PAGE 2 OF 7  
DATE 04/25/94 10:53:33  
BY AKL

WBS	DESCRIPTION	ESTIMATE SUBTOTAL	ONSITE INDIRECTS	SUB TOTAL	ESCALATION % TOTAL	SUB TOTAL	CONTINGENCY % TOTAL	TOTAL DOLLARS
110000	DEFINITIVE DESIGN	440000	0	440000	20.45	89980	25	662475
120000	CONST. ENGRG/INSPECTION	150000	0	150000	24.37	36555	25	233194
	SUBTOTAL 12 ENGINEERING/INSPECTION	150000	0	150000	24.37	36555	25	233194
	SUBTOTAL 1 ENGINEERING	590000	0	590000	21.45	126535	25	895669
200001	STACKER/RETRIEVER SYSTEM	3940467	0	3940467	18.03	710466	30	6046213
200002	CYBERMOTION SPIRMASTER SYSTEM	221920	0	221920	10.03	40012	30	340512
	SUBTOTAL 2 PROCUREMENT	4162387	0	4162387	18.03	750478	30	6306725
320000	CONSTRUCTION - FIXED PRICE	1461871	350540	1820411	22.10	402311	25	2770402
	SUBTOTAL 32 FIXED PRICE CONTRACT	1461871	350540	1820411	22.10	402311	25	2770402
	SUBTOTAL 3 CONSTRUCTION	1461871	350540	1820411	22.10	402311	25	2770402
400000	PROJECT INTEGRATION	200000	0	200000	21.78	60984	25	426230
	SUBTOTAL 4 PROJECT INTEGRATION	200000	0	200000	21.78	60984	25	426230
PROJECT TOTAL		6,494,258	350,540	6,852,798	19.56	1,340,308	28	10,487,076

KAISER ENGINEERS HANFORD  
WESTINGHOUSE HANFORD COMPANY  
JOB NO. ERS153

\*\* TEST - INTERACTIVE ESTIMATING \*\*  
CONVERSION OF HOT CELL AREA TO STORAGE AREA  
ROUGH ORDER OF MAGNITUDE (ROM)  
DOE-ROJ - ESTIMATE BASIS SHEET

PAGE 3 OF 7  
DATE 04/25/94 09:21:01  
BY AKL

1. DOCUMENTS AND DRAWINGS

DOCUMENTS: W-112, ENHANCED RADIOACTIVE & MIXED WASTE STORAGE PHASE V, CONCEPTUAL ESTIMATE, DATED 06/05/92

DRAWINGS: NONE

2. MATERIAL PRICES

UNIT COSTS REPRESENT CURRENT PRICES FOR SPECIFIED MATERIAL.

3. LABOR RATES

CURRENT KEM BASE CRAFT RATES, AS ISSUED BY KEM FINANCE (EFFECTIVE 10-01-93), INCLUDE FRINGE BENEFITS, LABOR INSURANCE, TAXES AND TRAVEL WHERE APPLICABLE, PER HANFORD SITE STABILIZATION AGREEMENT, APPENDIX A (EFFECTIVE 09-06-93). NON CRAFT HOURLY RATES ARE BASED ON THE 1994 FISCAL YEAR BUDGET LIQUIDATION RATES AS ISSUED BY KEM FINANCE (EFFECTIVE 10-01-93).

4. GENERAL REQUIREMENTS/TECHNICAL SERVICES/OVERHEADS

- 1-3 A.) ONSITE CONSTRUCTION FORCES GENERAL REQUIREMENTS, TECHNICAL SERVICES AND CRAFT OVERHEAD COSTS ARE INCLUDED AS A COMPOSITE PERCENTAGE BASED ON THE KEM ESTIMATING FACTOR/BILLING SCHEDULE, REVISION 16, DATED OCTOBER 01, 1993. THE TOTAL COMPOSITE PERCENTAGE APPLIED TO ONSITE CONSTRUCTION FORCES LABOR, FOR THIS PROJECT, IS 93% FOR SHOP WORK AND 134% FOR FIELD WORK, WHICH IS REFLECTED IN THE "OH&P/B&I" COLUMN OF THE ESTIMATE DETAIL.
- B.) ONSITE CONTRACT ADMINISTRATION AND CONSTRUCTION MANAGEMENT COSTS, ASSOCIATED WITH THE OVERALL MANAGEMENT OF THE FIXED PRICE CONTRACTS, ARE INCLUDED AS A COMPOSITE PERCENTAGE AND LUMP SUM ALLOWANCE (FOR BID PACKAGE PREP) BASED ON THE ESTIMATING FACTOR/BILLING SCHEDULE. THE TOTAL COMPOSITE PERCENTAGE AND LUMP SUM ALLOWANCE ARE APPLIED AGAINST THE TOTAL FIXED PRICE CONTRACT AMOUNT WHICH IS REFLECTED ON THE KEM SUMMARY REPORT DOLRO7, INCLUDED WITH THIS ESTIMATE. (FINAL ESTIMATES MAY BE PARTIALLY HANLOADED AND INCLUDED WITHIN THE ESTIMATE DETAIL)
- C.) FIXED PRICE CONTRACTOR OVERHEAD, PROFIT, BOND AND INSURANCE COSTS HAVE BEEN APPLIED AT THE FOLLOWING PERCENTAGES AND ARE REFLECTED IN THE "OH&P/B&I" COLUMN OF THE ESTIMATE DETAIL:  
LABOR - 45% MATERIAL - 20% EQUIPMENT USAGE - 10% EQUIPMENT - 5% SUBCONTRACTS - 15%

5. ESCALATION

ESCALATION PERCENTAGES WERE CALCULATED BY THE HANFORD MATERIAL & LABOR ESCALATION STUDY, DATED FEBRUARY 1993.

6. ROUNDING

U.S. DEPARTMENT OF ENERGY - DOE ORDER 5100.4 PAGE 1-32 SUBPARAGRAPH (M), REQUIRES ROUNDING OF ALL GENERAL PLANT PROJECTS (GPP'S) AND LINE ITEM (LI) COST ESTIMATES. REFERENCE: DOE 5100.4, FIGURE 1-11, DATED 10-31-84.

7. REMARKS

- A.) THIS ESTIMATE WAS EXTRACTED FROM THE CONCEPTUAL DESIGN ESTIMATE FOR PROJECT W-112, ENHANCED RADIOACTIVE & MIXED WASTE STORAGE PHASE V, DATED 06/05/92. GUIDANCE WAS PROVIDED VERBALLY BY WHC AND ICF-KH FOR TOTAL SCOPE OF WORK, ALONG WITH ALLOWANCES FOR ENGINEERING AND MANAGEMENT FUNCTIONS.

CAISER ENGINEERS HANFORD  
WESTINGHOUSE HANFORD COMPANY  
JOB NO. ER5153

\*\* TEST - INTERACTIVE ESTIMATING \*\*  
CONVERSION OF HOT CELL AREA TO STORAGE AREA  
ROUGH ORDER OF MAGNITUDE (ROM)  
DOE\_R04 - COST CODE ACCOUNT SUMMARY

PAGE 4 OF 7  
DATE 04/25/94 10:53:43  
BY AKL

COST CODE/WBS	DESCRIPTION	ESTIMATE SUBTOTAL	ONSITE INDIRECTS	SUB TOTAL	ESCALATION % TOTAL	SUB TOTAL	CONTINGENCY % TOTAL	TOTAL DOLLARS
<b>000 ENGINEERING</b>								
110000	DEFINITIVE DESIGN	440000	0	440000	20.45	89980	25	662475
120000	CONST. ENGRG/INSPECTION	150000	0	150000	24.37	36555	25	233194
400000	PROJECT INTEGRATION	280000	0	280000	21.78	60984	25	426230
<b>TOTAL 000 ENGINEERING</b>		<b>870000</b>	<b>0</b>	<b>870000</b>	<b>21.55</b>	<b>187519</b>	<b>25</b>	<b>1321899</b>
<b>700 SPECIAL EQUIP/PROCESS SYSTEMS</b>								
200001	STACKER/RETRIEVER SYSTEM	3940467	0	3940467	18.03	710466	30	6046213
200002	CYBERMOTION SPINMASTER SYSTEM	221920	0	221920	18.03	40012	30	340512
320000	CONSTRUCTION - FIXED PRICE	1461871	358540	1820411	22.10	402311	25	2778402
<b>TOTAL 700 SPECIAL EQUIP/PROCESS SYSTEM</b>		<b>5624258</b>	<b>358540</b>	<b>5982798</b>	<b>19.27</b>	<b>1152789</b>	<b>28</b>	<b>9165127</b>
<b>PROJECT TOTAL</b>		<b>6,494,258</b>	<b>358,540</b>	<b>6,852,798</b>	<b>19.56</b>	<b>1,340,308</b>	<b>28</b>	<b>10,467,026</b>

KAISER ENGINEERS HANFORD  
WESTINGHOUSE HANFORD COMPANY  
JOB NO. ER5153

\*\* TEST - INTERACTIVE ESTIMATING \*\*  
CONVERSION OF HOT CELL AREA TO STORAGE AREA  
ROUGH ORDER OF MAGNITUDE (ROM)  
DOE\_R05 - ESTIMATE SUMMARY BY CSI DIVISION

PAGE 5 OF 7  
DATE 04/25/94 10:53:51  
BY AKL

CSI	DESCRIPTION	ESTIMATE SUBTOTAL	ONSITE INDIRECTS	SUB TOTAL	ESCALATION % TOTAL	SUB TOTAL	CONTINGENCY % TOTAL	TOTAL DOLLARS
ENGINEERING								
00	TECHNICAL SERVICES	870000	0	870000	21.55	187519	25	1321899
	TOTAL ENGINEERING	870,000	0	870,000	21.55	1,057,519	25	1,321,099
CONSTRUCTION								
08	DOORS, WINDOWS AND G	51750	12161	63911	22.10	14124	25	97545
10	SPECIALTIES	690	15162	15852	22.10	3503	25	24194
11	EQUIPMENT	994175	233631	1227806	22.10	271345	25	1873939
12	FURNISHINGS	4600	1081	5681	22.11	1256	25	8671
13	SPECIAL CONSTRUCTION	4166987	1081	4168068	18.04	751734	30	6395396
14	CONVEYING SYSTEMS	63250	14864	78114	22.10	17263	25	119221
15	MECHANICAL	88578	20816	109394	22.10	24176	25	166962
16	ELECTRICAL	254228	59744	313972	22.10	69300	25	479199
1-5	TOTAL CONSTRUCTION	5,624,258	358,540	5,982,798	19.27	7,135,587	28	9,165,127
PROJECT TOTAL		6,494,258	358,540	6,852,798	19.56	8,193,106	28	10,487,026

KAISER ENGINEERS HANFORD  
WESTINGHOUSE HANFORD COMPANY  
JOB NO. ER5153

\*\* TEST - INTERACTIVE ESTIMATING \*\*  
CONVERSION OF HOT CELL AREA TO STORAGE AREA  
ROUGH ORDER OF MAGNITUDE (ROM)  
DOE\_R06 - CONTINGENCY ANALYSIS BASIS SHEET

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BY AKL

REFERENCE: ESTIMATE BASIS SHEET  
COST CODE ACCOUNT SUMMARY

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THE U.S. DEPARTMENT OF ENERGY - RICHLAND ORDER 5700.3 "COST ESTIMATING, ANALYSIS AND STANDARDIZATION" DATED 3-27-85, PROVIDES GUIDELINES FOR ESTIMATE CONTINGENCIES. THE GUIDELINE FOR A STUDY (ROM) ESTIMATE SHOULD HAVE AN OVERALL RANGE OF 20% TO 30% WITH AN EXPERIMENTAL/SPECIAL CONDITIONS RANGE TO 50%.

CONTINGENCY IS EVALUATED AT THE THIRD COST CODE LEVEL AND SUMMARIZED AT THE PRIMARY AND SECONDARY COST CODE LEVEL OF THE DETAILED COST ESTIMATE.

#### ENGINEERING

##### COST CODE 000

WBS 1.1.0.0.0.0, WBS 1.2.0.0.0.0 & WBS 4.0.0.0.0.0

A 25% CONTINGENCY WAS APPLIED TO THE ENGINEERING AND PROJECT MANAGEMENT ALLOWANCES DUE TO THE ROUGH ORDER OF MAGNITUDE TYPE CONSTRUCTION COST ESTIMATE AND MINIMAL DESIGN AVAILABILITY AT THIS TIME. THE DESIGN AND MANAGEMENT ALLOWANCES WERE CALCULATED AS A PERCENT OF TOTAL CONSTRUCTION DOLLARS.

##### COST CODE 700

WBS 2.0.0.0.0.1 AND WBS 2.0.0.0.0.2

A 30% CONTINGENCY WAS EXTRACTED FROM THE W-112 CONCEPTUAL ESTIMATE AND APPLIED TO THE SAME EQUIPMENT COSTS WITHIN THIS ESTIMATE.

WBS 3.2.0.0.0.0

A 25% CONTINGENCY WAS APPLIED TO THE CONSTRUCTION PORTION OF THE FACILITY PREPARATION REQUIREMENTS DUE TO THE VERY LIMITED INFORMATION PROVIDED AT THIS TIME. GUIDANCE FOR CONTINGENCY ALLOWANCES WAS ALSO EXTRACTED FROM THE W-112 PROJECT.

AVERAGE ENGINEERING CONTINGENCY 25%

AVERAGE CONSTRUCTION CONTINGENCY 20%

AVERAGE PROJECT CONTINGENCY 28%

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KAISER ENGINEERS HANFORD  
WESTINGHOUSE HANFORD COMPANY  
JOB NO. ER5153

\*\* TEST - INTERACTIVE ESTIMATING \*\*  
CONVERSION OF HOT CELL AREA TO STORAGE AREA  
ROUGH ORDER OF MAGNITUDE (ROM)  
DOE\_R07 - ONSITE INDIRECT COSTS BY WBS

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BY AKL

WBS	DESCRIPTION	ESTIMATE SUBTOTAL	CONTRACT %	ADMINISTRATION TOTAL	BID PACK PREP.	OTHER INDIRECTS	TOTAL INDIRECTS
*****	*****	*****	*****	*****	*****	*****	*****
110000	DEFINITIVE DESIGN	440000	0.00	0	0	0	0
120000	CONST. ENGRG/INSPECTION	150000	0.00	0	0	0	0
200001	STACKER/RETRIEVER SYSTEM	3940467	0.00	0	0	0	0
200002	CYBERMOTION SPIRMASTER SYSTEM	221920	0.00	0	0	0	0
320000	CONSTRUCTION - FIXED PRICE	1461871	23.50	343540	15000	0	358540
400000	PROJECT INTEGRATION	200000	0.00	0	0	0	0
PROJECT TOTAL		6,494,250		343,540	15,000	0	358,540

**KAISER  
ENGINEERS  
HANFORD**

WHC-SD-WM-ES-288, Rev. 0

**224-T BUILDING - PHASE III  
CONVERSION OF HOT CELL TO STORAGE AREA  
BA/BO SCHEDULE - CAPITAL**

8-1

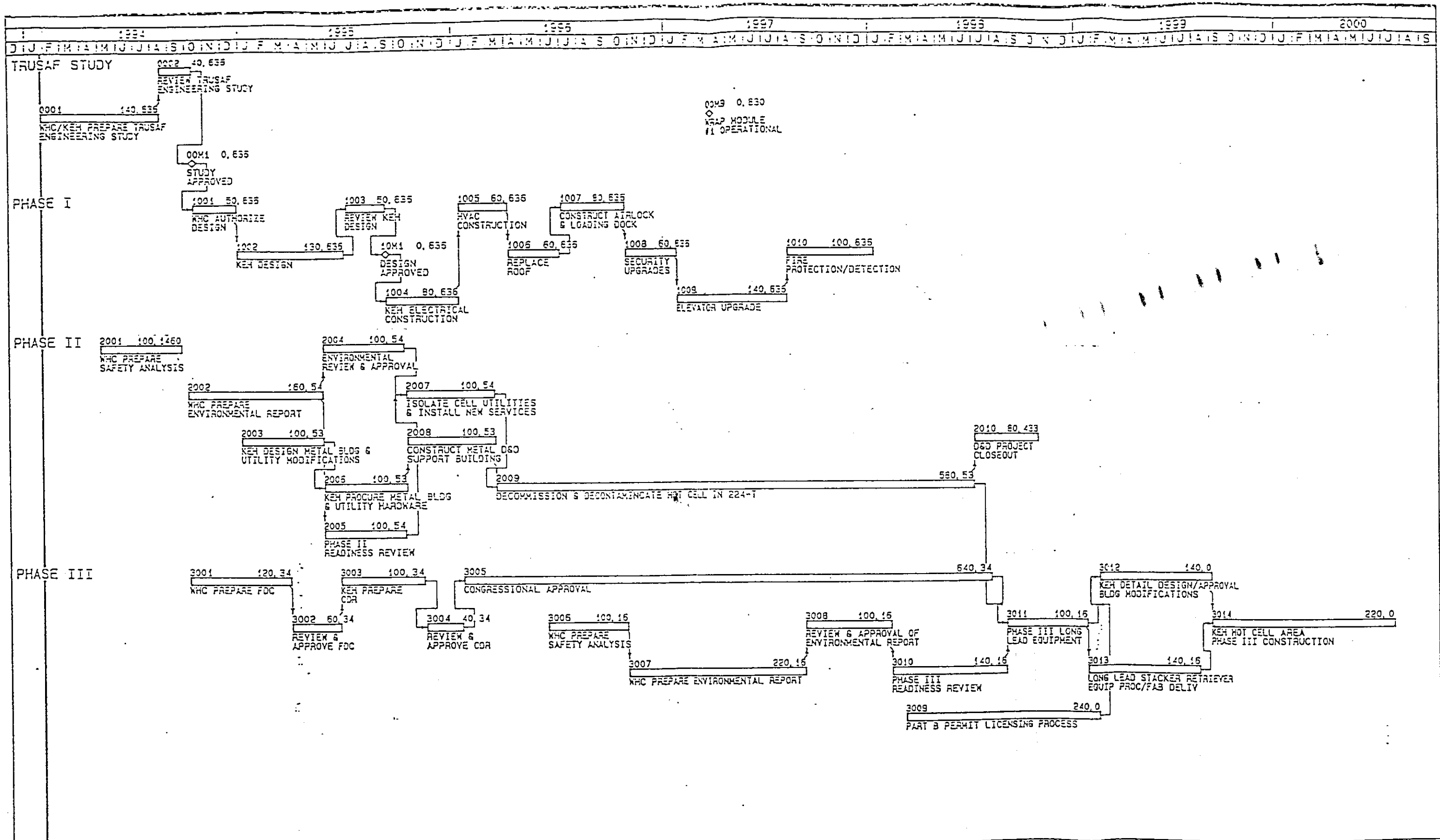
	Total Cost	FY 1995				FY 1996				FY 1997				FY 1998				FY 1999				FY 2000			
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
1.0 ENGINEERING	663																	663 / 663							
1.2 ENGINEERING AND INSPECTION	233																						233 / 233		
2.1 PROCUREMENT	6387																	6387 / 6387							
3.0 CONSTRUCTION	2778																						2778 / 2778		
4.0 PROJECT MANAGEMENT	426																	260 / 200					166 / 226		
<b>Total BA/BO</b>	<b>10487</b>																	<b>7309 / 7249</b>					<b>3177 / 3237</b>		
Dollars in Thousands																									

## APPENDIX J

### Integrated Program Schedule

(Phases I, II, and III)

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